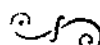
STANDARD VALUES *in* BLOOD

Being the first fascicle of a Handbook of Biological Data

EDITED BY

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Foreword

On January 31, 1949, the National Academy of Sciences - National Research Council contracted with the Wright Air Development Center, United States Air Force, to gather and compile for publication the more basic established data on the composition and reactions of blood. A compact volume was desired that would contain authoritative tabular data of most pressing need to scientists working in the various fields of biology, including the medical sciences. The present work, first issued as Air Force Technical Report No. 6039, is the result.

The direction of the work was entrusted to the Committee on the Handbook of Biological Data, an organ of the American Institute of Biological Sciences. The Institute is affiliated with the National Research Council as a unit in the Council's Division of Biology and Agriculture. The membership of the Committee is representative of the major fields in plant and animal biology.

Seeking the highest degree of authoritativeness for the work, the Committee recognized that the specialist in a field from which a table is drawn can best exercise the critical judgment necessary to evaluate and select data for an authoritative table. The specialist can best identify those data born of the most acceptable methods of measurement and those having the greatest likelihood, or actual history, of reproducibility in competent hands. The Committee accordingly prescribed that in the selection and review of data the broadest collaboration be sought among investigators in hematology and related fields.

To the Editor has fallen the responsibility of determining the table of contents and the format and composition of each table as it appears on the page, and of enlisting the aid of contributors to supply the necessary data and of reviewers to give the data independent evaluation. The editorial office has also been the focus of advice and counsel sought and received in generous measure from all fields of biology *

Acknowledgment is made, on behalf of the Committee, to the Wright Air Development Center, United States Air Force, for the foresight and scientific judgment inherent in the commission to prepare this tabular monograph on blood, to the biologists of this and other countries whose generous devotion of time as contributors and reviewers has made possible the completion of the work as it stands, and to the many others, unlisted, who have given the Committee solicited advice.

Acknowledgment is made to Dr. Cloyd Heck Marvin, President of The George Washington University, for generously making it possible for a member of his faculty to assume the editorship; to Dr. J. W. Heim, member of the Committee and project director for the Wright Air Development Center, for his unflagging effort toward bringing to realization the idea of a handbook of tabular biological data, and to Dr. Ulrich K Henschke for giving the manuscript meticulous and critical study.

Finally the Editor acknowledges with gratitude the loyalty and labors of his administrative assistant, Mrs. Dorothy C. Stafford, and of his staff of research analysts, Dr. Habeeb Bacchus, Mr. Harold J. Berman, Mr. Albert Einheber, Mr. Howard L. Gordon, Mr. Louis P. Munan, Mr. William S Spector and Dr Wasley D Yushok.

ERRETT C. ALBRITTON

*Two other comparable collections of tabular data are nearing completion as the present work goes to press, one drawn from the field of nutrition and metabolism and the other from that of growth, reproduction and life history Both plant and animal forms are included Other collections are planned.



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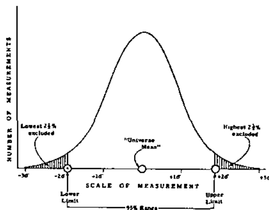
Introduction

The tables in this unusually complete collection of data on blood are unique in the high degree of reliability sought for the data. Data have been supplied and authenticated by over six hundred leading investigators in biology and clinical medicine. The tables have been exhaustively reviewed, some by as many as twenty experts in the field.

The tables are also unique in their treatment of the well known phenomenon of biological variability. In addition to giving a single representative value for each item covered in a table (the value is known in statistical terms as the estimated "universe mean") the tables present information on variability in a most easily comprehensible and directly usable form. The reader who seeks to know the range of variation of a quantity does not need to perform a calculation, as he must do when only the "standard deviation" is reported, but may read directly from the table the estimated upper and lower limits of the "95% range." The method of estimate, in each case, is identified by a simple code letter, which at the same time rates the individual range as to its trustworthiness. Range data as commonly encountered represent a mixture of variability as it exists between individuals and variability as it exists within individuals.

The significance of the code letters, used as superscripts attached to the ranges in the tables, follows:

(a) By the method of greatest accuracy, the 95% range is obtained by fitting a recognized type of frequency curve to a group of measured values and excluding the extreme 2.5% of area under the curve at each end. (See sketch to the right.)



(b) By a less accurate method, the 95% range is estimated by a simple statistical calculation, assuming a "normal distribution" and using the "standard deviation." This estimate is used when the group of values is too small for curve fitting, as is usually the case.

(c) A third and still less accurate procedure for estimate of the 95% range is simply to give the highest value and lowest value of the reported sample group of measurements. It underestimates the 95% range for small samples and overestimates for larger sample sizes, but may be used in preference to the preceding method when the sample shows convincing evidence that the variable is asymmetrical in distribution.

(d) The upper and lower limits of the range of variation, as commonly encountered by an investigator experienced in measuring the quantity in question, constitute still another estimate of the 95% range. The trustworthiness of limits so placed should not be underestimated.

In many instances, where information as to the manner of estimate has been lacking at the time of going to press, it has been necessary to report an estimate of the 95% range without an identifying superscript. Effort to assemble the missing information is continuing.

Although the data in each table are the best available at the time the table was prepared, it is recognized that all data are subject to revision as investigators improve techniques and make more measurements. The reader is warned against attributing significance to small differences from species to species. He is invited to submit any values or ranges that he feels should be given consideration, and is particularly invited to add to the coverage of animal forms.

TABLES

1. BLOOD SPECIFIC GRAVITY

Blood (B), RBC (C), Plasma (P)

	Animal		Value			Range	Temperature[1] (°C)	Method
	(A)		(B)			(C)	(D)	(E)
1	Man		B	♂	1.056	1.052-1.061[b]	25/4	Copper Sulfate
2			C	♂	1.093[2]	1.089-1.097[b]		
3			P	♂	1.024	1.022-1.026[b]		
4			C		1.099	1.094-1.107[c]		Gravimetric
5			P		1.028	1.026-1.031[c]		
6	Cat		B	♂	1.050	1.046-1.054[b]	T/T	Falling Drop
7			B	♀	1.051	1.045-1.057[b]		
8	Cattle	adult[3,4]	B	♀	1.052	1.046-1.058[b]	20/4	Gravimetric
9		young[3,5]	B	♀	1.053	1.046-1.061[b]		
10		adult	C	♂	1.084	1.079-1.090[b]		Gravimetric
11			P	♂	1.029	1.026-1.033[b]		
12	Dog	adult[6]	B		1.052		22-26/4	Falling Drop
13		young[7]	B		1.045			
14	Goat[8]		B	♂	1.042	1.036-1.048[b]	25/4	Copper Sulfate
15			B	♀	1.044	1.036-1.051[b]		
16			B	♂♀	1.042	1.035-1.049[b]		
17			P	♂	1.023	1.019-1.026[b]		
18			P	♀	1.021	1.018-1.024[b]		
19			P	♂♀	1.022	1.019-1.025[b]		
20	Horse		B	♂[9]♀	1.053	1.046-1.059[c]	20/4	Benzene-Chloroform
21	Mouse[10]		B		1.057	1.052-1.062[b]	25/4	Falling Drop
22	Pig, young[11]		B	♂	1.047	1.038-1.055[b]	25/4	Copper Sulfate
23			B	♀	1.043	1.035-1.052[b]		
24			B	♂♀	1.046	1.039-1.054[b]		
25			P	♂	1.022	1.021-1.025[b]		
26			P	♀	1.023	1.020-1.027[b]		
27			P	♂♀	1.022	1.019-1.025[b]		
28	Rabbit		B		1.050	1.048-1.052[b]	25/4	Falling Drop
29			C		1.098	1.093-1.104[c]		Gravimetric
30			P		1.025	1.018-1.031[b]		
31	Rat[13]		B		1.056[12]	1.054-1.058[b]	25/4	Falling Drop
32			B	♂	1.054	1.046-1.061[b]	25/4	Copper Sulfate
33			B	♀	1.054	1.046-1.061[b]		
34			P	♂	1.023	1.017-1.028[b]		
35			P	♀	1.022	1.018-1.027[b]		
36			P	♂♀	1.023	1.018-1.028[b]		
37	Sheep		B	♂[9]♀	1.051[14]	1.041-1.061[b]	20/4	Benzene-Chloroform
38			C		1.084	1.080-1.087[c]		Gravimetric
39			P		1.028	1.025-1.029[c]		

/1/ Referred to water at 4°C or to water at temperature of measurement (T). /2/ Of "packed" cells, not corrected for an estimated 7% of trapped plasma, corrected = 1.098 (1.095-1.101). /3/ Mostly Holstein-Friesian strain /4/ 2.5-18 yrs /5/ 18-30 months. /6/ Mongrels. /7/ 1-3 days. /8/ Angora and Toggenburg strains, 1-2 yrs /9/ Castrated. /10/ CBA strain, 60-80 days. /11/ Duroc-Jersey, Poland-China, Chester White strains. /12/ Sprague-Dawley, 200-250g /13/ Mixed strains, 100-300g. /14/ Cheviot, blackface, grayface strains.

2. RELATIVE VISCOSITIES, BLOOD, PLASMA, SERUM

	Animal	Temperature of Meas. (°C)	Relative Viscosity[1]		
			Blood[2]	Plasma[3]	Serum[3]
	(A)	(B)	(C)	(D)	(E)
1	Man	38	4.7	1.8	1.5
2	Cat	38	4.2		
3	Dog	38	4.7		
4		37	5.5		
5	Goat	20	4.0		
6	Horse	20	4.1	1.9	1.7
7	Ox	20	4.6		
8	Pig	20	5.9		1.6
9	Rabbit	37	3.4		1.4
10	Sheep	20	4.3	1.6	1.5
11	Frog	15	2.8[4]		1.5
12	Turtle	20	2.2[4]		

/1/ Relative to water at the temperature of measurement. Absolute viscosity = relative viscosity x absolute viscosity of water. Absolute viscosity of water in poises (=dyne-seconds/cm^2), accurate to within 2%, is 0.00680 at 38°C, 0.00692 at 37°C, 0.0101 at 20°C, and 0.0114 at 15°C. /2/ Apparent viscosity as measured in capillary tube viscosimeters with radii greater than 0.05cm, length greater than 150 radii, and at apparent Reynolds numbers in the range 50-800 (apparent Reynolds number = urd/v' where u = mean velocity, r = tube radius, d = density, and v' = apparent viscosity, all expressed in c.g.s. units). Apparent viscosity of blood varies inversely with the temperature of measurement, directly with the protein content, and with the hematocrit. Hematocrits for above values not available in original reports. Hematocrit differences may be the chief reason for variations among species and between the sexes. /3/ Calculated from protein concentration in g/100ml plasma or serum (=c) and fluidity lowering constant (=k) where apparent viscosity = 100/(100-kc); k = 5.8 for coordinates 1D, 4.8 for 1E, 7.0 for 6D, 6.1 for 6E, 5.7 for 8E, 5.3 for 9E, 6.5 for 10D, 5.8 for 10E. For values of c, see table on Plasma Proteins, Laboratory and Farm Animals. /4/ Corrected for defibrination (=10% less viscous than whole blood).

3. BLOOD MISCELLANEOUS PHYSICAL PROPERTIES

RBC (C); Plasma (P); Serum (S)

	Variable and Animal (A)		Value (B)	Range (C)
	Electrical charge[1] (millivolts)			
1	Man	C	-16.8	
2	Cat	C	-17.8	
3	Dog	C	-21.1	
4	Guinea pig	C	-14.2	
5	Monkey, rhesus	C	-17.0	
6	Mouse	C	-17.9	
7	Rabbit	C	- 7.0	
8	Rat	C	-18.6	
	Electrophoretic mobility[1] (cm^2/volt sec x 10^{-4})			
9	Man	C	1.31	
10	Cat	C	1.39	
11	Dog	C	1.65	
12	Guinea pig	C	1.11	
13	Monkey, rhesus	C	1.33	
14	Mouse	C	1.40	
15	Rabbit	C	0.55	
16	Rat	C	1.45	
	Electrical conductivity (Mhos x 10,000)			
	Man			
17	at 25°C	S	120	117-124[c]
18	at 20°C	S	106	105-111[c]
	Freezing point depression (°C)			
19	Man	S	- 0.562	-0.555 to -0.570[c]
20	Dog	S	- 0.571	
21	Horse	S	- 0.564	
22	Ox	S	- 0.585	
23	Pig	S	- 0.615	
24	Rabbit	S	- 0.592	
25	Sheep	S	- 0.619	
26	Fish, pike	S	-0.514	
27	Fish, plaice	S	-0.732	
28	Fish, tench	S	-0.523	
	Refractive index			
29	Man[2]	S		1.34920-1.35110[c]
30	Fish, cod[3]	S	1.34215	1.34182-1.34249[c]
31	Fish, plaice[3]	S	1.34165	1.34052-1.34237[c]
32	Fish, tench[3]	S	1.34089	1.34082-1.34094[c]
	Specific heat (gram calories)			
33	Man	P	0.94	
34	Man	C	0.77	
35	Man	P+C	0.87	

/1/ M/15 phosphate buffer at pH 7.4. /2/ At 17.5°C with Abbe refractometer, refractive index of water being 1.33320. /3/ At 17.5°C with Zeiss Pulfrich refractometer calibrated with distilled water and standard salt solutions at the same temperature.

4. BLOOD[1] COLLOIDS, OSMOTIC PRESSURE

	Class (A)		Animal (B)	mm of water[2] Value (C)	mm of water[2] Range (D)
1	Amphibia		Frog (Rana catesbiana)	103	96-115[c]
2			Frog (Rana temporaria)	70	-140[c]
3			Toad (Bufo vulgaris)	133	83-242[c]
4	Aves		Hen	150	140-160[c]
5			Dove	110	80-120[c]
6	Elasmobranchs		Dogfish, lesser spotted		31-36[c]
7			(Scyliorhinus caniculus)[3]		
8			Dogfish, smooth (Mustelus mustelus)[3]		57-64[c]
9			Dogfish, spiny (Squalus acanthias)[3]		42-43[c]
10			Ray, electric (Torpedo marmorata)		42-52[c]
11	Mammalia		Man	330	280-480[c]
12			Cat	300	240-330[c]
13			Dog	310	230-470[c]
14			Goat	300	300-310[c]
15			Guinea pig	250	230-280[c]
16			Horse	280	230-350[c]
17			Ox	280	260-300[c]
18			Pig	330	300-350[c]
19			Rabbit	290	230-350[c]
20			Rat	260	220-290[c]
21			Sheep	300	290-340[c]
22	Pisces	Fresh Water	Carp, common (Cyprinus carpio)		100-113[c]
23			Eel (Anguilla anguilla)[3]	225	
24			Pike (Esox lucius)		112-146[c]
25			Tench (Tinca vulgaris)	101	93-109[c]
26		Sea Water	Bass (Labrax lupus)		174-250[c]
27			Cod (Gadus morrhua)	113	112-114[c]
28			Eel, conger (Conger conger)[3]		146-173[c]
29			Gurnard (Trigla lucerna)		195-213[c]
30			Mackerel (Scomber scombrus)		196-198[c]
31			Plaice (Pleuronectes platessa)	115	107-126[c]
32			Scorpion fish (Scorpaena scrofa)		181-186[c]
33			Turbot (Rhombus maximus)	174	
34	Reptilia		Turtle (Malacoclemmys) spring[4]	58	48-68[c]
35			fall[5]	96	81-112[c]

/1/ Serum. Variations in osmotic pressure due to differences in temperature of measurement (in the range of 0^{o}-37^{o}C) are generally less than those due to error of measurement. /2/ mm of water/13.546 = mm of Hg. /3/ Original report in literature for 7B = Scyllium canicula, for 8B = Mustelus hinnulus, for 9B = Acanthias vulgaris, for 23B = Anguilla vulgaris, and for 28B = Conger vulgaris. /4/ Fasting. /5/ Fed.

5. ERYTHROCYTE SEDIMENTATION RATE, TIME[1]

	Animal	mm/hr Value[2]	mm/hr Range[2]	Method of:
	(A)	(B)	(C)	(D)
	Man			
1	Adult		♂ 0-8	Cutler
2			♀ 0-10	
3			♂ 0-6	Landau
4			♀ 0-9	
5			♂ 0-10	Smith
6			♀ 0-10	
7			♂ 0-8	Walton
8			♀ 0-8	
9			♂ 0-15	Westergren
10			♀ 0-20	
11			♂ 0-9	Wintrobe
12			♀ 0-15	
13	Child	8.6	4-13	Cutler
14		9.1[3]	3-13	Smith
15	Cat	7.30	4-13	Reichel
16		3		Linzenmeier-Raunert
17	Cattle	1.17	1-1.8	Reichel
18		1		Linzenmeier-Raunert
19	Dog		♂♀ 1-4	Wintrobe
20			♀[4] 1-52	
21		2		Linzenmeier-Raunert
22		4	2.5-5	Reichel
23	Goat	0.50		Reichel
24	Guinea pig	1.67	1.25-2	Reichel
25		1.06	0.75-1.75b	Westergren
26		1.5		Linzenmeier-Raunert
27	Horse	18		Cutler
28		127	119-136	Reichel
29		69		Linzenmeier-Raunert
30	Pig	5.35	3-8	Reichel
31		5		Linzenmeier-Raunert
32	Rabbit	1.0[5]		Wintrobe
33		2	1.5-2.5	Reichel
34		2		Linzenmeier-Raunert
35	Rat	♂ 0.7		Cutler
36		♀ 1.8		
37	Sheep	0.55	0.5-0.75	Reichel
38		0.5		Linzenmeier-Raunert
39	Fowl	3.75	2-6	Reichel
40		4		Linzenmeier-Raunert
41	Goose	3.42	2.75-4	Reichel
42	Man		6-10 hrs.[6]	Linzenmeier
43	Guinea pig	60 hrs.[6]		
44	Rabbit		17-42 hrs.[6]	

/1/ Increased during infections, diseases associated with inflammation and tissue injury, with hemodilution; decreased with hemoconcentration. /2/ *Measured at the end of the first hour*; rate is usually unchanged within the first hour; rates in succeeding hours decrease asymptotically. /3/ 12 days-14 yrs; capillary blood. /4/ 11-56 days pregnant. /5/ No change after thyroidectomy. /6/ Sedimentation time.

6. ERYTHROCYTE FRAGILITY: MAN

Venous Blood (Bv), Oxygenated Blood (Bo), Cutaneous Blood (Bc)

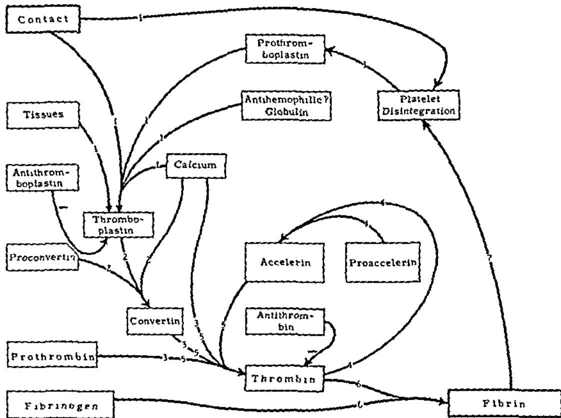
	Anticoagulant	Temperature (°C)	Dilution of Blood[1]	Duration of Hemolysis		% NaCl Solution (g NaCl/100 ml) for 10% Hemolysis	for 50% Hemolysis	for 90% Hemolysis	Method of Determining Degree of Hemolysis
	(A)	(B)	(C)	(D)		(E)	(F)	(G)	(H)
1	Waxed tube		1 in 26	20 min	Bo	0.43[2]	0.38[2]	0.34[2]	Hemoglobin liberated
2	No anticoagulant		1 in 200	30 min	Bc	0.47[2]	0.43[2]	0.40[2]	R B C count
3	Oxalate	Rm temp	1 in 201	30 min	Bv	0.46[2]	0.41[2]	0.37[2]	Hemoglobin liberated
4	Oxalate	37	1 in 41[3]	30 min	Bv	0.46[2]		0.22[2]	Hemoglobin liberated

/1/ Volume of blood in volume of total mixture of blood and hemolyzing solution. /2/ Estimated from graphs. /3/ Washed cells. /4/ Hemolysis "starts" at. /5/ Hemolysis "complete" at.

7. ERYTHROCYTE FRAGILITY: VERTEBRATES OTHER THAN MAN

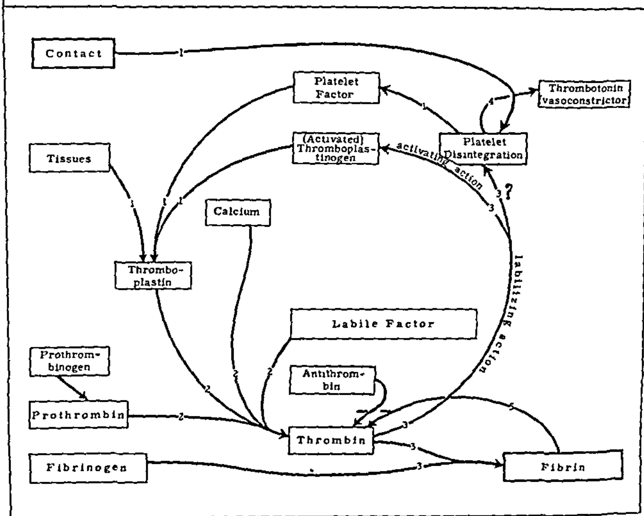
	Animal	%NaCl Solution (g/100ml) for Initial Hemolysis	for Complete Hemolysis
	(A)	(B)	(C)
1	Baboon		0.18
2	Camel		0.26
3	Cat	0.69	0.50
4	Kitten	0.58	0.47
5	Chimpanzee		0.28
6	Dog	0.45	0.36
7	Dromedary	0.17	0.07
8	Goat	0.62	0.48
9	Guinea pig	0.45	0.33
10	Horse	0.59	0.39
11	Lemur		0.42
12	Llama	0.17	0.03
13	Marmoset		0.40
14	Mouse	0.54	0.33
15	Ox	0.59	0.42
16	Pig	0.74	0.45
17	Rabbit	0.57	0.45
18	Rat	0.48	0.38
19	Sheep	0.60	0.45
20	Lamb	0.69	0.48
21	Chicken	♂ 0.40	0.32
22		♀ 0.41	0.28

8. BLOOD COAGULATION: Theory of P.A. Owren (1952)



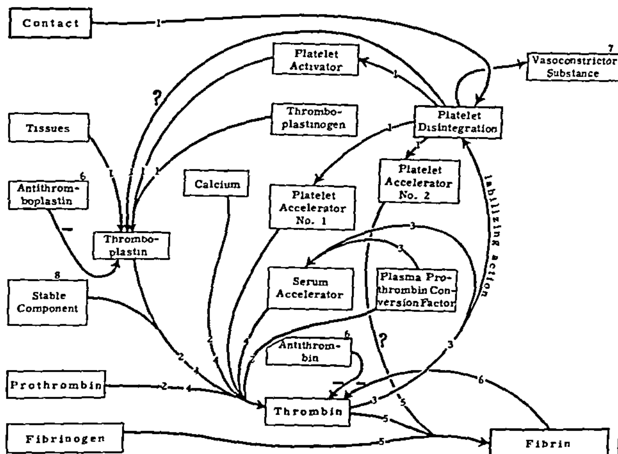
/1/ Tissue injury yields thromboplastin directly, while contact causes disintegration of platelets and release of prothromboplastin, which is activated by contact, "antihemophilic globulin" and calcium to give thromboplastin. /2/ Thromboplastin and proconvertin in the presence of calcium form convertin. An anticonvertin probably exists which opposes the activity of convertin. /3/ Convertin together with calcium brings about a minimal conversion of prothrombin to thrombin /4/ This initially formed thrombin starts the accelerator system, i.e., the conversion of proaccelerin to accelerin. /5/ Accelerin accelerates the conversion of prothrombin to thrombin in the presence of convertin and calcium. /6/ Thrombin is now in sufficient quantity to convert fibrinogen to fibrin. /7/ Fibrin provokes the disintegration of the platelets with further release of thromboplastic substances already mentioned.

9. BLOOD COAGULATION: Theory of A.J. Quick (1952)



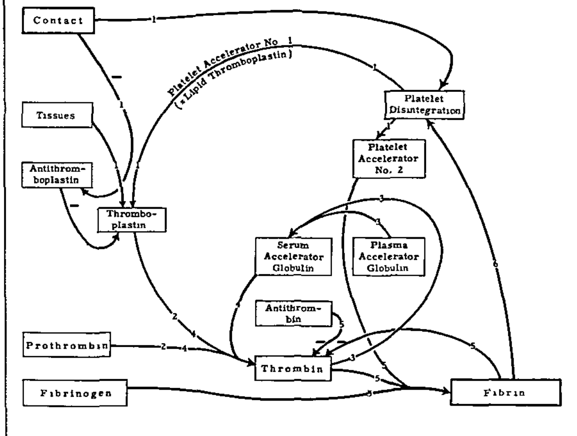
/1/ Thromboplastin is (a) released directly by injured tissue and is also (b) formed by the interaction of plasma thromboplastinogen and a platelet factor, the latter released from disintegrating platelets. /2/ Thromboplastin, prothrombin, calcium, and a labile factor, interact stoichiometrically to form thrombin. In human blood part of the prothrombin is in an inactive form, prothrombinogen. On contact with a rough surface it becomes activated /3/ The thrombin formed not only converts fibrinogen to fibrin, but activates thromboplastinogen and thereby probably brings about the lysis of platelets and initiates the chain reaction. /4/ The platelets also release a vasoconstrictor, thrombotonin, under the labilizing action of thrombin. The resulting local vasoconstriction aids in the hemostatic process. /5/ The prompt removal of thrombin by fibrin holds in check the autocatalytic reaction mediated through the action of thrombin on platelets and thromboplastinogen.

11. BLOOD COAGULATION: Theory of M. Stefanini (1952)



/1/ Injured tissue yields thromboplastin directly, while platelet disintegration yields, (a) platelet activator, which interacts with plasma thromboplastinogen (and possibly another plasma component) to form thromboplastin, (b) possibly, thromboplastin directly and (c) two accelerators principles, Nos. 1 and 2. /2/ Thromboplastin, calcium, plasma prothrombin conversion factor and stable component interact to bring about a minimal conversion of prothrombin to thrombin. /3/ This initially formed thrombin initiates the autocatalytic phase of the process, i. e., (a) starts the accelerator system--the conversion of plasma prothrombin conversion factor into a more active form, i. e., serum accelerator, and (b) "labilizes" the platelets to release more platelet activator and accelerators. /4/ Thromboplastin and calcium, together with serum accelerator, platelet accelerator No. 1 and, possibly, stable component cause accelerated conversion of prothrombin to thrombin. /5/ A now sufficient quantity of thrombin, aided by the action of platelet accelerator No. 2, converts fibrinogen to fibrin. /6/ Antithromboplastin and antithrombin act to decrease the speed of coagulation reactions in which they are involved. The fibrin clot, by adsorbing thrombin, also effectively checks the autocatalytic mechanism of blood coagulation. /7/ The platelet disintegration which takes place at the site of vascular injury also liberates a vasoconstrictor agent which aids in the arrest of the hemorrhage. /8/ Stable component is a factor which appears decreased during dicumarol therapy and is sharply decreased in the hypoprothrombinemia of the newborn Its properties are very similar to those of prothrombin.

12. BLOOD COAGULATION: Theory of L. M. Tocantins (1952)



/1/ Contact of the blood with certain surfaces (damaged blood vessel endothelium, glass) initiates the first changes [illegible]

is, the conversion of inactive plasma accelerator globulin to active serum accelerator globulin. /4/ Thromboplastin together with serum accelerator globulin causes acceleration of the conversion of prothrombin to thrombin. /5/ Some of the thrombin may be inactivated by antithrombin. The thrombin that escapes such inactivation acts, with the aid of platelet accelerator No 2, to cause the conversion of fibrinogen to fibrin. Some of the excess thrombin is removed from the plasma by adsorption on fibrin. /6/ Fibrin probably causes further disintegration of platelets.

13. BLOOD COAGULATION TIME: MAN

Venous Blood (Bv); Cutaneous Blood (Bc); Venous Plasma (Pv)

	Method	Temperature (°C)		Clotting Time[1] Minutes		Method of:
				Value	Range	
	(A)	(B)		(C)	(D)	(E)
1	1 ml blood in tube	Rm. Temp.	Bv	6.5	5-8	Lee and White
2			Bc	3.0	2-4	
3		37	Bv	11.5	7-15[b]	Tocantins
4	2 ml blood in each of 2 tubes	Rm. Temp.	Bv	8.9	3.5-14.3[b]	Aggeler and Lucia
5		37	Bv	7.5	4.7-10.4[b]	
6		25	Bv		10.5-19.5	Lewis
7		29	Bv		6.5-14.5	
8		37	Bv		5.5-12.5	
9		45	Bv		5-9.5	
10	1 ml blood in each of 4 tubes	Rm. Temp.	Bv	11.0	5-20	Copley and Houlihan
11	1 ml blood in paraffined tube	37	Bv	29.3	16-43[b]	Tocantins
12	1 ml blood in siliconed tube		Bv		22-61	Lewis
13	2 ml blood in each of 2 lusteroid tubes	37	Bv		25-50	Diggs
14	Bead of blood on platinum wire	37	Bc		1.5-2	Gibbs
15	Blood in 5 fine capillary tubes[4]	37	Bc		3-7	
16	0.1 ml oxalated plasma + $CaCl_2$ in each of 2 tubes	37	Pv		1.5-2.3[2,3]	Quick
17	0.2 ml oxalated plasma + $CaCl_2$ in each of 2 tubes	23-26	Pv	5.3[2]	3-8[c]	Cheney
18	0.6 ml oxalated plasma + $CaCl_2$ in tube	37	Pv	2.7[2,5]	2-3.5[c]	Nygaard

/1/ Time varies with method; shortened by agitation, high temperature, uncoated glass, rapid vs slow centrifugation, etc. /2/ "Plasma recalcification time," "coagulation time of recalcified plasma." /3/ Tube centrifuged at 1000 rpm should not clot more than 15 sec sooner than tube centrifuged at 3000 rpm. /4/ Tubes broken to read end point. /5/ Photoelectric end point reading.

14. HEPARIN-RETARDED BLOOD COAGULATION TIME: MAN

Venous Blood (Bv)

	Method	Temperature	Heparin added µg	Clotting Time Minutes			Method of:
					Value	Range	
	(A)	(B)	(C)	(D)		(E)	(F)
1	1 ml blood + heparin in tube	Rm. Temp.	1	Bv		8-16	de Takats
2			4	Bv	25	20-28[c]	
3	1 ml blood + heparin in tube	Rm. Temp.	0.8[1]	Bv	18	10-25	Waugh and Ruddick
4			1.5[1]	Bv	28	19-38	
5			2.3[1]	Bv	38	29-52	
6			3.1[1]	Bv	48	35-60	
7			3.8[1]	Bv	57	43-70	
8			4.6[1]	Bv	64	52-83	
9			5.4[1]	Bv	71	64-88	
10	1 ml blood + heparin in tube	Rm. Temp.	10	Bv		40-60	Tuft and Rosenfield

/1/ Originally reported in Toronto units. 1 µg = 0.13 units.

15. HEPARIN TOLERANCE: MAN

Venous Blood (Bv)

	Method	Temperature (°C)	Clotting Time Minutes			Method of:
				Value	Range	
	(A)	(B)	(C)		(D)	(E)
1	10 min. after 10 mg heparin intravenously, 1 ml blood in 1 capillary tube[2]	37[1]	Bv		5-7[d,3]	de Takats
2	10 min. after 25 mg heparin intravenously, 1 ml blood in 1 tube	37	Bv		40-90[3,4]	Hagedorn and Barker

/1/ Held in palm of hand. /2/ Tube broken to read end point. /3/ Range excludes hypo- and hyper-reactors. /4/ Approx. 88% range.

16. SKIN BLEEDING TIME[1]: MAN

Finger (F); Earlobe (E); Forearm, volar surface (Fv)

	Method		Wound Depth mm	Bleeding Time Seconds			Method of:
				Value		Range	
	(A)		(B)	(C)		(D)	(E)
1	Puncture skin; blood absorbed every 15-30 seconds		3	F;E		60-180	Duke
2			3-4	Fv	147	0-450[c,2]	
3	Puncture skin; immerse wound in physiological saline, 37°C		6	F		17-340[c,3]	Copley and Lalich
4	Sphygmomanometer cuff maintained at 40 mm Hg pressure; skin puncture; blood absorbed every:	15-30 sec.	2	Fv	192	0-384[b]	Ivy
5			3-4	Fv	248	30-570[c]	
6			3	Fv	240[5]	30-720[c,4,5]	
7		10 sec.	3	Fv		0-240[6]	

/1/ Depends upon skin temperature, skin circulation, area punctured, thickness of skin, depth of puncture, psychic influences, etc. /2/ In 95% of persons, less than 374 seconds. /3/ In 95% of persons, less than 180 seconds. /4/ Frank bleeding should stop by 360 seconds; blood tinged oozing may last another 360 seconds. /5/ Average of two tests. /6/ Includes 99.54% of persons.

17. BLOOD CLOT RETRACTION VOLUME, TIME: MAN

	Variable			Value	Range	Method of:
	(A)			(B)	(C)	(D)
1	Clot Retraction	Volume %	Extracorpuscular clot volume[1] as % of volume of blood specimen[2]	7.9	-4.1[3] to 19.9[b]	Aggeler and Lucia
2			Expressed serum volume as % of volume of blood specimen[4]		40-55	Diggs
3			Expressed serum volume as % of total serum present in blood specimen[5]	78.1	62-94[b]	Tocantins
4		Time Minutes	Venous blood in test tube at room temp.		30-60	Diggs
5			Drop of blood in castor oil	33	20-45	Hirschboeck

/1/ = "Fluid volume of clot." /2/ The clot exclusive of RBC, WBC, and platelets, after clot retraction at 1 hr at 37°C. /3/ Negative values may occur due to discrepancies between methods of measurement of formed elements vs. total clot volume. /4/ After maximal clot retraction. /5/ Venous blood in paraffin tube, 13 mm diam., at 37°C, 2 hr. Amount of serum initially present calculated from the hematocrit.

18. PLASMA PROTHROMBIN TIME[1]: MAN

Venous Blood (Bv); Cutaneous Blood (Bc); Venous Plasma (Pv)

	Method	Temperature (°C)	Thromboplastin added	Clotting Time Seconds			Method of:
					Value	Range	
	(A)	(B)	(C)		(D)	(E)	(F)
1	0.1 ml oxalated plasma + $CaCl_2$	37	Rabbit brain[3]	Pv		11-12	Quick
2		37	Rabbit brain[4]	Pv		17-19	Magath and Hurn
3		38.5	Russell viper[5] venom + lecithin	Pv	10	8-12[b]	Witts and Hobson
4		37	Human brain[3]	Pv	11.5	10-13[b]	Aggeler and Lucia
5		37	Rabbit brain[3]	Pv	24	19-29[b,8]	Shapiro et al
6	0.2 ml oxalated plasma + $CaCl_2$	Rm. Temp.	Russell viper[5] venom	Pv	23	16-30[c]	Page and Russell
7	0.1 ml 12.5%,[7] oxalated plasma + CaCl[2]	37	Rabbit brain[3]	Pv[7]	41	34-48[b,8]	Shapiro et al
8	0.1 ml 25%,[7] oxalated plasma + $CaCl_2$	37	Human brain[3]	Pv[7]	28	21-35[b]	Aggeler and Lucia
9	0.1 ml 50%,[7] oxalated plasma + $CaCl_2$	37	Human brain[5]	Pv[7]	16	13-19[b]	
10	0.1 ml oxalated blood + $CaCl_2$	Rm. Temp.	Rabbit brain[3]	Bc	20	18-22[d]	Kato and Poncher
11	0.03-0.04 ml blood	Rm. Temp.	Beef lung or rabbit brain[6]	Bc		20-30	Karabin and Anderson
12	0.9 ml blood	Rm. Temp.	Beef lung or rabbit brain[3]	Bv		25-50	Ziffren et al

/1/ Results of different methods are not comparable due to differences in concentration of reacting substances. Departures from normal can be adjudged as such only by comparison with normal controls run in the same laboratory. /2/ See also Table 19. /3/ Acetone dehydrated. /4/ Dried at 37°C. /5/ Daboia. /6/ Fresh. /7/ Oxalated plasma diluted with physiological saline. /8/ The authors draw conclusions from the difference between the values for diluted and undiluted plasma.

19. PLASMA PROTHROMBIN, RELATIVE LEVELS[1,2]: VERTEBRATES

	Animal	Two-Stage Test[3] *Dog = 100%*		Animal	Two-Stage Test[3] *Dog = 100%*
	(A)	(B)		(A)	(B)
1	Man	84[4]	6	Rat	95
2	Cat	91	7	Chicken	50
3	Dog	100	8	Turtle	42
4	Guinea pig	53	9	Dogfish	8
5	Rabbit, albino	89	10	Sea bass	31
			11	Stingray	27

/1/ Data inadequate for stable estimate of universe mean. /2/ Dog plasma normally contains approximately 350 units of prothrombin/ml of plasma. A unit of prothrombin = amount required to form 1 unit of thrombin which is the quantity that will cause clotting of 1 ml of standard fibrinogen solution in 15 seconds, under standard conditions. /3/ Method of Warner, Brinkhous and Smith. Oxalated, and diluted venous plasma is defibrinated by precipitation with ammonium sulfate. The prothrombin is converted to thrombin by use of thromboplastins. The thrombin is assayed against a standard fibrinogen solution. Somewhat different relative values are obtained by the Quick one-stage method. /4/ Mean = 294 units/ml; range = 273-325 units/ml.

20. PLASMA ACCELERATOR GLOBULIN, RELATIVE LEVELS[1,2]: VERTEBRATES

	Animal	One-Stage Method[3] Rabbit = 100%	Two-Stage Method[4] Dog = 100%[5]		Animal	One-Stage Method[3] Rabbit = 100%	Two-Stage Method[4] Dog = 100%[5]
	(A)	(B)	(C)		(A)	(B)	(C)
1	Man	2	85	6	Rabbit, albino	100	94
2	Cat		80	7	Rat, albino		36
3	Cow	15	74	8	Chicken	5	2
4	Dog	20	100	9	Turtle		2
5	Guinea pig	10	21				

/1/ Data inadequate for stable estimate of universe mean. /2/ =Labile Factor, Proaccelerin (Factor V), or plasma prothrombin conversion factor. /3/ Method of Quick and Stefanini. /4/ Method of Ware and Seegers. /5/ =176 units/ml plasma. A unit of plasma Ac globulin=1000 times the amount that when present in 1 ml of a reacting mixture of prothrombin, thromboplastin, and calcium will reproduce a standard curve of thrombin production.

21. BLOOD PLATELET COUNT: MAN

Arterial blood (Ba); Venous blood (Bv); Cutaneous blood (Bc)

		Platelet Count thousands/mm^3 Value	Range	Method of:	
		(A)	(B)	(C)	
1	Ba	♂ 350		Direct	Tocantins
2	Bv	♂ 310	150-690	Direct	Tocantins
3	Bc	♂ 250	180-358	Direct	Tocantins
4	Bv	♂ 294	204-395	Direct	Kristenson
5	Bv	♀ 291	214-360	Direct	Kristenson
6	Bc	♂ 273	170-313	Direct	Kristenson
7	Bc	♂♀ 409	273-545[b]	Direct	Rees-Ecker
8	Bv	♂ 257	140-440[b]	Direct	Brecher-Cronkite
9	Bc	716	500-900[1]	Indirect	Dameshek
10	Bc	234	130-350	Indirect	Fonio
11	Bc	514	437-586	Indirect	Olef

/1/ 84% range.

	Animal	Platelet Count thousands/mm³ blood		Investigator
		Value	Range	
	(A)	(B)	(C)	(D)

22. BLOOD PLATELET COUNT: LABORATORY, FARM ANIMALS

	Animal	Platelet Count thousands/mm^3 blood		Investigator
		Value	Range	
	(A)	(B)	(C)	(D)
1	Cat	345	164-500	Field, 1930
2		422		Lawrence & Valentine, 1947
3		493	368-712	Arndt, 1925
4		519	356-760	Weiser, 1922
5	Cattle	684	542-975	Arndt, 1925
6	Calf	490		Mariconda, 1933
7	Dog	461[1,2]	188-960[c]	Tocantins, 1936
8		467[3]	353-535	Aynaud, 1909
9		492	298-793	Arndt, 1925
10	Guinea pig	638[4]	584-856	Ledingham, 1915
11		719[1]	550-880	Watabiki, 1917
12		783[1,4]	525-900	Tocantins, 1938
13	Horse	335	249-461	Weiser, 1922
14		352	254-560	Hikmet, 1927
15	Monkey[1,6]	267	155-424	Krumbhaar & Musser, 1920
16	Mouse	278	246-339	Copley & Robb, 1942
17		987		Jacobson, 1944
18	Pig	403	296-616	Hikmet, 1925
19	Rabbit	533[1]	170-1,120[c,5]	Casey & Rosahn, 1932
20		536[7]	424-586	Aynaud, 1909
21	Rat	454[1]	190-760	Yamamoto, 1933
22		477[1]	232-641	Shechet et al., 1935
23		754	702-796	Olson, 1939
24		795	620-950	Ma, 1932
25		800	500-1,000	Creskoff et al., 1942
26		823		Machella & Higgins, 1939
27	Sheep	441	284-659	Ercegovac, 1936

/1/ Direct method. /2/ Venous blood (ear). /3/ Arterial blood (femoral). /4/ Ear blood. /5/ Estimate "b" of 95% range = 288,000-788,000. /6/ Finger blood. /7/ Arterial and venous blood.

23. CAPILLARY FRAGILITY[1]: MAN
Suction Tests and Tourniquet Test

Forearm, outer surface (Fo); Forearm, antecubital space (Fa)

		Age	Diameter Skin Area Observed cm		Pressure Duration Minutes	Petechiae first appear at negative pressure, mm Hg. Value	Range	Method of:
		(A)	(B)		(C)	(D)	(E)	(F)
1	Suction Test[2] (Decompression)	All ages (3-90 years)	Fo	1	1	350	100->500	Dalldorf
2		1 month	Fa	1	1	425[3]		Lindquist
3		6 months	Fa	1	1	188[3]		
4		1 year	Fa	1	1	156[3]		
5		5 years	Fa	1	1	100[3]		
6		10 years	Fa	1	1	96[3]		
7		Adults	Fa	1	1	141	100-200[4]	
8		Newborn	Fa	1	1		250-	Frontali
9		2-10 years	Fa	1	1		200-250	
10		22-36 years	Fa	1	1		150-200	

		Applied Pressure mm Hg	Diameter Skin Area Observed cm		Pressure Duration Minutes	Petechiae Count Value	Range	Method of:
		(A)	(B)		(C)	(D)	(E)	(F)
11	Suction Test[2]	Negative 200	Fo	1	1		0-10	Aggeler & Lucia
12	Tourniquet Test[5] (Compression)	Positive 40	Fo		5	0		Diggs
13		50	Fo	5	15		0-4	
14		35;50[6]	Fa	6	15			Gothlin
15		$\left[\frac{\text{Syst. + Diast.}}{2}\right]$[7]	Fo	5	8		0-10[8]	Wright & Lillienfeld

/1/ Results vary with thickness, texture, and color of skin and other variables apart from the capillary resistance per se. /2/ Negative pressure applied by suction cup. /3/ Author's "Medianwerte" (derivation of these values obscure). Some hospital patients included. /4/ 94% range. /5/ Sphygmomanometer cuff placed on arm and inflated. /6/ Petechial index = 2 x (count after 35 mm Hg pressure, for 15 min.) plus, after 1 hr , 1 x (count after 50 mm Hg pressure, for 15 min); petechial index = 0-12. /7/ Pressure maintained at the midpoint between systolic and diastolic pressures of the individual. /8/ In 92% of persons, 10 or fewer petechiae; in 60%, none.

24. THE ABO SYSTEM[1] OF BLOOD FACTORS AND THEIR FREQUENCIES[2]

Blood Groups[3] (Phenotypes[4])		Genetic Determinants	RBC Agglutinogens[6]	Plasma Agglutinins[8]	Reactions between RBC and Antisera		
General	Differentiated	(Genotypes[5])			Anti-A	Anti-B	Anti-A_1
O 45%	O 45.00%	O/O 45.00%	O[7]	Anti-A, Anti-A_1 & Anti-B	Neg.[9]	Neg	Neg.
A 41%	A_1 31.39%	A_1/A_1 3.53%	A_1	Anti-B	Pos.[9]	Neg.	Pos.
		A_1/A_2 2.56%					
		A_1/O 25.30%					
	A_2 9.61%	A_2/A_2 0.46%	A_2		Pos.	Neg.	Neg.
		A_2/O 9.15%					
B 10%	B 10.00%	B/B 0.72%	B	Anti-A and Anti-A_1	Neg.	Pos.	Neg.
		B/O 9.28%					
AB 4%	A_1B 2.94%	A_1/B 2.94%	A_1 & B	None	Pos.	Pos	Pos.
	A_2B 1.06%	A_2/B 1.06%	A_2 & B		Pos.	Pos.	Neg.

/1/ Equivalents in obsolete terminologies of Moss and Jansky are: O = Moss IV, Jansky I; A = Moss and Jansky II; B = Moss and Jansky III; AB = Moss I, Jansky IV. /2/ Expected frequency, observed and calculated for U.S.A. whites. /3/ Blood groups, named after agglutinogens. Group determined by testing red cells vs. natural antiserum B from group A, and natural antiserum A and A_1 from group B. /4/ Phenotype: *the identifiable antigenic make-up of the red* cells, dependent on, but not necessarily indicating the complete gene pattern. /5/ Genotype: make-up of individual in terms of genes derived from parents. Diagonal (/) separates gene contributed by one parent from gene contributed by other parent. /6/ Agglutinogen (antigen): Structure on surface (?) of RBC responsible for reaction with corresponding agglutinin in antiserum. /7/ Group O (first characterized as O due to failure of RBC to clump in either anti-A or anti-B sera) has own agglutinogen, designated O. /8/ Agglutinin (antibody): Specific substance occurring in plasma, reacts with corresponding agglutinogen, to cause agglutination, possibly hemolysis. Anti-O very rare agglutinin, regularly agglutinates RBC of group O and subgroup A_2. /9/ Pos. = agglutination; Neg. = absence of agglutination.

25. THE DISTRIBUTION OF THE ABO BLOOD GROUPS IN VARIOUS POPULATIONS

Population Tested	Number Tested	Group O %	Group A %	Group B %	Group AB %
American Indians					
Toba (Argentina)	194	98.5	1.5	0	0
Blackfeet (Montana)	115	23.5	76.5	0	0
Pueblo (New Mexico)	310	78.4	20.0	1.6	0
Arabs, Baghdad	500	34.1	30.8	28.9	6.2
Australian Aborigines	805	53.1	44.7	2.1	0.0
Chinese, Peiping	1,000	30.0	25.0	35.0	10.0
Denmark	1,853	40.0	42.5	12.4	5.1
Egypt, Cairo	516	26.6	35.7	27.1	10.5
English, Liverpool	1,600	46.0	30.0	17.0	7.0
Eskimos, S.W. Greenland	1,063	36.3	54.6	5.3	3.7
Finns	23,200	34.1	41.0	18.0	6.9
Germans, Berlin	39,174	36.5	42.5	14.5	6.5
Hawaii	413	36.5	60.8	2.2	0.5
Hindus, North	1,000	31.3	19.0	41.2	8.5
Italians	17,157	41.2	39.4	14.0	5.4
Japanese, Tokyo	33,834	31.2	38.4	21.8	8.6
Negroes, Senegal	500	43.2	22.4	29.2	5.0
Russia	763	33.7	38.4	20.8	7.1
Swedes	1,200	37.9	46.7	10.3	5.1
Turkey, Macedonia	500	36.8	38.0	18.6	6.6
U.S.A., Negroes	1,003	49.3	26.0	21.0	3.7
U.S.A., Whites	20,000	45.0	41.0	10.0	4.0

26. HEREDITY OF THE ABO BLOOD GROUPS
Application in Disputed Paternity

If Parents' Groups are--	The Children's Groups	
	Can be--	Cannot be--
O and O	O	A, B, AB
O and A	A, O	B, AB
O and B	B, O	A, AB
A and A	A, O[1]	B, AB
A and B	AB, O[3], A[2], B[1]	None
B and B	B, O[2]	A, AB
O and AB	A, B	O, AB
A and AB	A, AB, B[1]	O
B and AB	B, AB, A[2]	O
AB and AB	A, B, AB	O

/1/ This type not possible if either parent is genetically A/A. /2/ This type not possible if one parent is genetically B/B. /3/ If one parent was genetically A/O and the other B/O, an O can result.

27. HEREDITY OF THE ABO SUBGROUPS
Application in Disputed Paternity

If Parents' Blood Groups and Subgroups are--	The Children's Blood Groups and Subgroups	
	Can be--	Cannot be--
A_1 and O	O[1], A_1, A_2[2]	B, A_1B, A_2B
A_1 and A_1	O[1], A_1, A_2[3]	B, A_1B, A_2B
A_1 and A_2	O, A_1, A_2	B, A_1B, A_2B
A_1 and B	O, A_1, A_2, B, A_1B, A_2B[2]	(None)
A_1 and A_2B	A_1, A_2, B, A_1B, A_2B	O
A_1B and O	A_1, B	O, A_2, A_1B, A_2B
A_1B and A_1	A_1, B, A_1B, A_2B[2]	O, A_2
A_1B and A_2	A_1, B, A_2B	O, A_2, A_1B
A_1B and A_2B	A_1, B, A_1B, A_2B	O, A_2
A_1B and B	A_1, B, A_1B	O, A_2, A_2B
A_1B and A_1B	A_1, B, A_1B	O, A_2, A_2B
A_2 and O	O, A_2	A_1, B, A_1B, A_2B
A_2 and A_2	O, A_2	A_1, B, A_1B, A_2B
A_2 and B	O, A_2, B, A_2B	A_1, A_1B
A_2B and O	A_2, B	O, A_1, A_1B, A_2B
A_2B and A_2	A_2, B, A_2B	O, A_1, A_1B
A_2B and B	A_2, B, A_2B	O, A_1, A_1B
A_2B and A_2B	A_2, B, A_2B	O, A_1, A_1B

/1/ O possible here if Blood Group A_1 (in 1st column) is of genotype A_1O. /2/ A_2 possible if the parent of Blood Group A_1 is of the genotype A_1/A_2. /3/ A_2 possible if one parent is of genotype A_1/A_2 and the other parent is A_1/A_2 or A_1O.

28. THE Rh-Hr (CDE-cde) SYSTEM OF BLOOD FACTORS[1] AND THEIR FREQUENCIES

Phenotypes and their Frequencies,[3] Classified by Agglutination Reactions by Antisera			Genotypes		
1 Anti-Serum (Anti-D)	3 Antisera (Anti-C, D, E)	6 Antisera (Anti-C, D, E, c, d, e)	Wiener[2] Terminology	Fisher-Race[2] Terminology	Calculated Frequencies (%)
Rh_o (D) Negative 16.4-16.8%	rh (CDE) 13.4-15.1%	rr (CDEcde)	rr	cde/cde	13.4 — 15.1
	rh' (CDE) 1.1-0.8%	r'r' (CDEcde)	r'r'	Cde/Cde	0.02 — 0.01
		r'r (CDEcde)	r'r	Cde/cde	1.1 — 0.8
	rh" (CDE) 0.4-0.9%	r"r" (CDEcde)	r"r"	cdE/cdE	0.003 — 0.014
		r"r (CDEcde)	r"r	cdE/cde	0.4 — 0.9
	rh'rh" (CDE) (rh_y) 0.02-0.03%	$r_y r$ (CDEcde)	r'r" / $r^y r$	Cde/cdE / CdE/cde	0.02 — 0.02 / 0.004
		$r_y r'$ (CDEcde)	$r^y r'$	CdE/Cde	0.0003 — 0.0001
		$r_y r"$ (CDEcde)	$r^y r"$	CdE/cdE	0.0001 — 0.0021
		$r_y r_y$ (CDEcde)	$r^y r^y$	CdE/CdE	0.000001 — 0.0000001
Rh_o (D) Positive 83.1-83.2%	Rh_o (CDE) 2.5-2.1%	R_oR_o (CDEcde)	R^oR^o	cDe/cDe	0.1 — 0.07
		R_or (CDEcde)	R^or	cDe/cde	2.4 — 2.0
	Rh_1 (CDE) 51.2-53.4%	R_1R_1 (CDEcde)	R^1R^1	CDe/CDe	16.9 — 17.7
		R_1r' (CDEcde)	R^1r'	CDe/Cde	1.1 — 0.8
		R_1R_o (CDEcde)	R^1R^o	CDe/cDe	2.6 — 2.2
		R_1r (CDEcde)	R^1r / R^or'	CDe/cde / cDe/Cde	30.6 — 32.7 / 0.05
	Rh_2 (CDE) 16.5-14.1%	R_2R_2 (CDEcde)	R^2R^2	cDE/cDE	2.7 — 2.0
		$R_2r"$ (CDEcde)	$R^2r"$	cDE/cdE	0.2 — 0.3
		R_2R_o (CDEcde)	R^2R^o	cDE/cDe	1.1 — 0.7
		R_2r (CDEcde)	R^2r / $R^or"$	cDE/cde / cDe/cdE	12.5 — 11.0 / 0.06
		R_zR_o (CDEcde)	R^zR^o / R^1R^2	CDE/cDe / CDe/cDE	13.9 — 0.01 / 11.9
	Rh_1Rh_2 (CDE) (Rh_z) 14.9-13.6%	R_zR_1 (CDEcde)	R^zR^1	CDE/CDe	0.08 — 0.20
		R_zr' (CDEcde)	R^zr' / R^1r^y	CDE/Cde / CDe/CdE	0.001 — 0.005 / 0.004
		R_zR_2 (CDEcde)	R^zR^2	CDE/cDE	0.01 — 0.07
		$R_zr"$ (CDEcde)	$R^zr"$ / R^2r^y	CDE/cdE / cDE/CdE	0.0004 — 0.006 / 0.0014
		R_zR_z (CDEcde)	R^zR^z	CDE/CDE	0.0001 — 0.0005
		R_zr_y (CDEcde)	R^zr^y	CDE/CdE	0.00002 — 0.00002

/1/ Note Plus (+) indicates agglutination by antiserum. Thus C = agglutination of red cells by anti-C (anti-rh') and ... [illegible]

29. THE DISTRIBUTION OF THE Rh-Hr BLOOD TYPES IN VARIOUS POPULATIONS

Population Tested	No. of Persons Tested	Rh Positive: Rh_o %	Rh_1: Rh_1Rh_1 %	Rh_1: Rh_1rh %	Rh_2 %	Rh_1Rh_2 %	Rh_1Rh_z %	Rh Negative: rh %	rh' %	rh'' %	rh'rh'' %
American Indians											
Mexico	95	1.1	40.7	7.4	9.5	38.1	3.1	0.0	0.0	0.0	0.0
Oklahoma	105	2.9	34.3	5.7	17.1	36.2	2.9	0.0	0.9	0.0	0.0
Ute	104	0.0	33.7		28.8	37.5	-	0.0	0.0	0.0	0.0
Asiatic Indians	156	1.9	70.5		5.1	12.8	-	7.1	2.6	0.0	0.0
Australian, Aborigines	100	4.0	39.0	14.0	21.0	15.0	6.0	0.0	1.0	0.0	0.0
Australian, Whites	350	0.6	54.0		12.6	16.6	-	14.9	0.9	0.6	0.0
Chinese	132	0.9	60.6		3.0	34.1	-	1.5	0.0	0.0	0.0
England, Whites	927	2.5	19.7	35.2	12.2	13.6	0.1	14.8	0.7	1.3	0.0
Eskimos	315	1.0	34.9		19.7	44.4	-	0.0	0.0	0.0	0.0
Filipinos	100	0.0	87.0		2.0	11.0	-	0.0	0.0	0.0	0.0
Holland, Whites	200	1.5	51.5		12.3	17.7	-	15.4	1.5	0.0	0.0
Indonesians	200	0.5	74.0		2.5	22.5	0.0	0.0	0.0	0.0	0.5
Japanese	150	0.0	37.4		13.3	47.3	-	1.3	0.0	0.0	0.7
Papuans	100	0.0	89.0	4.0	0.0	4.0	3.0	0.0	0.0	0.0	0.0
Puerto Ricans	179	15.1	39.1		19.6	14.0	-	10.1	1.7	0.5	0.0
U.S.A., Whites	7,317	2.2	53.5		15.0	12.9	-	14.7	1.1	0.6	0.01
U.S.A., Whites	766	2.2	20.9	33.8	14.9	13.9	0.1	12.5	0.9	0.5	0.0
U.S.A., Negroes	223	41.2	20.2		22.4	5.4	-	8.1	2.7	0.0	0.0
U.S.A., Negroes	135	45.9	0.9	22.8	16.3	4.4	0.0	7.4	1.5	0.7	0.0

30. THE MNS SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES[1]

Blood Types[2] (Phenotypes)		Genetic Determinants (Genotypes)[3]	RBC Agglutinogens[4]	Reactions between RBC and Antisera[5]		
General	Differentiated			Anti-M	Anti-N	Anti-S
M 28.53%	Ms 7.74%	Ms/Ms 7.74%	M and s	Pos.[6]	Neg.[6]	Neg.
	MS 20.79%	MS/Ms 14.26%	M, S and s	Pos.	Neg.	Pos.
		MS/MS 6.53%	M and S			
N 21.68%	Ns 14.78%	Ns/Ns 14.78%	N and s	Neg.	Pos.	Neg.
	'NS 6.90%	NS/Ns 6.24%	N, S and s	Neg.	Pos	Pos.
		NS/NS 0.66%	N and S			
MN 49.80%	MNs 21.45%	Ms/Ns 21.45%	M, N and s	Pos	Pos.	Neg
	MNS 28.35%	MS/Ns 19.68%	M, N, S and s	Pos.	Pos.	Pos.
		Ms/NS 4.52%	M, N, S and s			
		MS/NS 4.15%	M, N and S			

/1/ Expected frequency, calculated for English whites. /2/ MNS system is independent of the ABO system. A person of group O, for example, may belong to type M, or N, or MN. Types take names after agglutinogens. M and N determined by testing red cells against induced antisera prepared by immunizing rabbits against red cells of known type. S types determined by testing blood with selected human sera containing anti-S. /3/ Diagonal (/) separates gene contributed by one parent from gene contributed by other parent. /4/ M, N, and S are relatively weak antigens in man. S is a property believed very closely linked, genetically, to the M-N alleles. s is assumed but has not been demonstrated with a specific antiserum, therefore, the S/S genotype (e.g., MS/NS) can be distinguished from the S/s genotype (e.g., MS/Ms) only by family studies. /5/ Natural anti-M and anti-N occur rarely. Anti-S has not been identified as a natural agglutinin and has not been produced in animals. Anti-M and anti-N typing sera obtained by immunizing rabbits with human type M and type N cells, respectively. /6/ Pos. = agglutination, Neg. = absence of agglutination.

31. THE DISTRIBUTION OF THE MN BLOOD FACTORS IN VARIOUS POPULATIONS				
Population	No. Tested	Frequency of Types, %		
		M	N	MN
Ainu	504	17.9	31.9	50.2
American Indians				
U.S.A.[1]	205	60.0	4.9	35.1
Blackfeet	95	54.7	5.3	40.0
Australian Aborigines	730	3.0	67.4	29.6
Chinese	1,029	33.2	18.2	48.6
Danes	2,023	29.1	21.4	49.5
Egyptians, Cairo	613	28.3	23.1	48.6
English	1,522	30.5	21.4	48.2
Eskimos S.W. Greenland	377	67.6	2.4	30.0
Finns	6,926	42.3	13.7	44.0
French	1,400	30.1	19.8	50.1
Germans	40,255	30.2	19.7	50.0
Hindus	300	42.7	10.7	46.7
Italians	736	28.9	17.1	53.9
Japanese	7,551	29.0	21.1	49.9
Russians	763	32.2	21.2	46.5
Swedes	1,200	36.1	16.9	47.0
U.S.A. Negroes	278	28.4	21.9	49.6
U.S.A. Whites	6,129	29.2	21.3	49.6

/1/ Information on tribe not available.

32. HEREDITY OF THE MN BLOOD FACTORS: Application in Disputed Paternity		
If Parents' Factors are--	The Children's Factors	
	Can be--	Cannot be--
MN and MN	M, N, MN	None
MN and M	M, MN	N
MN and N	N, MN	M
M and N	MN	M, N
M and M	M	N, MN
N and N	N	M, MN

33. THE K ("KELL-CELLANO") SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES[1]

Blood Factors (Phenotypes)			Genetic Determinants (Genotypes)[2]	RBC Agglutinogens[3]	Reactions between RBC and Antisera[4]	
					Anti-Kell (Anti-K)	Anti-Cellano (Anti-k)
Cellano Negative 0.2-0.27%	Kell Positive 8.8-10.17%	KK	K/K 0.2-0.27%	K	Pos.[5]	Neg.[5]
Cellano Positive 99.8-99.73%		Kk	K/k 8.6-9.90%	K and k	Pos.	Pos.
	Kell Negative 91.2-89.83%	kk	k/k 91.2-89.83%	k	Neg.	Pos.

/1/ The first % = frequency of occurrence among U.S.A. whites; the second, among English whites. /2/ Diagonal (/) separates gene contributed by one parent from gene contributed by the other parent. /3/ The Kell-Cellano factors named after the patients from whom the agglutinins were first obtained. /4/ No natural agglutinins have been found in man, nor have agglutinins been obtained from animals. Antisera for typing are prepared by absorption of unwanted agglutinins (as anti-A and anti-B) with red cells containing A and/or B, or by use of saliva or other A and B containing substances. Since K/K individuals are rare, anti-k is difficult to obtain. Only one example of anti-k has been found, the result of active immunization of a K/K woman by her K/k infants, causing her to develop k antibodies. Many examples of anti-K are known. /5/ Pos. = agglutination; Neg. = absence of agglutination.

34. THE Le ("LEWIS") SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES[1]					
Blood Factors (Phenotypes)		Genetic Determinants (Genotypes[2])	RBC Agglutinogens	Reactions between RBC and Antisera[4]	
				Anti-Le^a	Anti-Le^b
Lewis positive 20.5%	Le(a+b-)	Le^a/Le^a	Le^a	Pos.[5]	Neg.[5]
Lewis negative 79.5%	Le(a-b+)	Le^a/Le^b	Le^b and Le^a[3]	Neg.	Pos.
		Le^b/Le^b	Le^b	Neg.	Pos.
	Le(a-b-)	?	?	Neg.	Neg.

/1/ Frequency observed for U.S.A. whites. /2/ Le^a = "Lewis" (Mourant) = L_1 (Andresen); $Le^b = L_2$ (Andresen). Diagonal (/) separates gene contributed by one parent from gene contributed by other parent. /3/ Le^a may be present; thus far available antisera do not detect it. Some persons negative to both anti-Le^a and Le^b, indicating the possible existence of a third, fairly common allele. /4/ All Anti-Lewis agglutinins are believed to be naturally occurring, but they are not common, and have not been obtained from animals. Typing sera are prepared by absorption of unwanted agglutinins (as anti-A and anti-B) with red cells containing agglutinogens A and/or B. /5/ Pos. = agglutination; Neg. = absence of agglutination.

35. THE Lu ("LUTHERAN") SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES[1]					
Blood Factors (Phenotypes)		Genetic Determinants (Genotypes[2])	RBC Agglutinogens[3]	Reactions[4] between RBC and Anti-Lu^a
Lutheran positive 8.0%	Lu (a+)	Lu^a/Lu^a 0.2%	Lu^a	Pos.[5]
		Lu^a/Lu^b 7.8%	Lu^a and Lu^b	Pos.
Lutheran negative 92.0%	Lu (a-)	Lu^b/Lu^b 92.0%	Lu^b	Neg.[5]

/1/ Expected frequency, observed and calculated for English whites, U.S.A.: Lu-positive, 19.1%; Lu-negative, 80.9%. /2/ Diagonal (/) separates gene contributed by one parent from gene contributed by other parent. /3/ Lu^b is assumed but has not been demonstrated with specific antiserum. /4/ No natural agglutinins have been found, but have been produced by deliberate transfusion. Anti-Lu^a has not been obtained from animals. Antisera prepared by absorption of unwanted agglutinins (as anti-A and anti-B) with red cells containing agglutinogens A and/or B. Donors whose sera contain agglutinins due to previous sensitization are very rare. /5/ Pos. = agglutination; Neg. = absence of agglutination.

36. *THE P SYSTEM OF BLOOD FACTORS* AND THEIR FREQUENCIES[1]

	Blood Factors (Phenotypes)[2]	Genetic Determinants (Genotypes)[3]	R B C Agglutinogens	Plasma Agglutinins[4]	Reactions[5] between R B C and Anti-P
P Positive 71.4%	PP	P/P 21.6%	P	?	Pos.[6]
	Pp	P/p 49.8%	P & p	?	Pos.
P Negative 28.6%	pp	p/p 28.6%	p	Anti-P[4]	Neg.[6]

/1/ Expected frequencies calculated for U.S.A. whites. /2/ p is assumed, but has not been demonstrated with a specific antiserum. /3/ Diagonal (/) separates gene contributed by one parent from that contributed by other parent. /4/ Anti-P is found occasionally, in very low titre, in P-negative individuals. It has been assumed to be a naturally occurring agglutinin and has frequently been obtained from normal animals. /5/ Typing sera are prepared by absorption of unwanted agglutinins (as anti-A and anti-B) with red cells containing agglutinogens A and/or B. /6/ Pos. = agglutination; Neg. = absence of agglutination.

37. BLOOD ERYTHROCYTE VALUES: MAN

	Variable (A)		Value (B)	Range (C)
1	R B C Count (millions/mm³ blood)		♂ 5.4	4.6-6 2[b]
2			♀ 4.8	4.2-5.4[b]
3			♂♀ 5.1	4 2-6 2[b]
4	R B C Packed Volume[1] (Hematocrit) (ml/100 ml blood)		♂ 47[2,4]	40-54[b]
5			♀ 42[2,4]	37-47[b]
6			♂♀ 44.5[2]	
7	Blood Hemoglobin Concentration (g/100 ml blood)		♂ 15.8	14.0-18.0[b]
8			♀ 13.9	11.5-16.0[b]
9			♂♀ 14.9	
10	R B C[3] Hemoglobin Concentration [illegible]		♂ 33.5[2,4]	30-40[b]
11			[illegible]	
12			[illegible]	[illegible]
13	[illegible]		[illegible]	[illegible]
14	[illegible] (μ)		[illegible]	[illegible]
15	Corpuscle[3] Thickness (μ)	Dry	♂♀ 2 0[6]	1.7-2.2[b]
16		Plasma	♂♀ 2 4	
17	Corpuscle[3] Surface Area (μ^2)	Dry	♂♀135[7]	129-146[b]
18		Plasma	♂♀163	
19	Corpuscle[2,3,4] Volume (μ^3)		♂ 87	70-94[b,8]
20			♀ 87	74-98[b,8]
21			♂♀ 87	
22	Corpuscle[3] Mass[9] (μμg)		♂ 96	77-103[b]
23	Corpuscle Specific Gravity[10]		♂ 1.0983	1 095-1.101[b]
24	Corpuscle[3] Hemoglobin Content (μμg)		o 29	25-34[b]
25			♀ 29	24-33[b]
26			♂♀ 29	23-35[b]
27	Corpuscle[3] Iron[11] Content (μμg)		♂♀ 0 10	0 08-0 12[b]
28	R B C Volume Coefficient[12] (ml R B C /100 ml blood, 5 million count)		♂ 43 5	
29			♀ 43.7	
30			♂♀ 43 6	
31	R B C Hemoglobin Coefficient[12] (g/100 ml blood, 5 million count)		♂ 14 6	
32			♀ 14 4	
33			♂♀ 14 5	
34	Color, Volume and Saturation Index[12]		♂♀ 1 00	0.85-1.15[b]
35	Corpuscle Spherocytic Index		♂♀ 0 27	

	Variable (A)		Value (B)	Range (C)
36	R B C Sedimentation Rate (mm/hr)	Westergren Method		♂ 0-15
37				♀ 0-20
38		Wintrobe Method		♂ 0-9
39				♀ 0-15
40		Cutler Method		♂ 0-8
41				♀ 0-10
42	R B C Fragility (% NaCl Solution)	Daland & Worthley Method Initial	♂♀ 0.47	0.48-0.46
43		Final	♂♀ 0 27	0.30-0.24
44		Giffin & Sanford Method Initial		♂♀0.44-0.42
45		Final		♂♀0.34-0.32
46		Parpart Method Mean	♂ 0.43	0.54-0.32
47	Erythrocyte Charge[14] (millivolts)		♂♀ -16 8	
48	Electrophoretic Mobility[14] (cm^2/volt sec.)		♂♀ 1 31 x 10^{-4}	
49	Erythrocyte pH		♂ 7.24	7 21-7.26
50	Erythrocyte Life Span[15] (days)		♂ 120	
51			♀ 109	
52			♂♀ 115	
53	Production Rate per Day	R B C (number/mm³ blood)	♂ 45,000	
54			♀ 40,000	
55			♂♀ 42,500	
56		R B C (millions/kg body wt)	♂ 3,500	
57			♀ 2,630	
58			♂♀ 3,065	
59		R B C blood equiv (ml blood/kg body wt)	♂ 0.65	
60			♀ 0 55	
61			♂♀ 0 60	
62		R B C & Hb replaced (% of total)	♂♀ 0.83	
63		Hemoglobin (g/100 ml blood)	♂ 0 13	
64			♀ 0.11	
65			♂♀ 0.12	

/1/ Centrifuged at 2000 g or over (= 3000 rpm) for 10 minutes after attaining constant packed cell volume, F = m w^2r (or, F = (1 118 x 10^{-5}) r n^2m) where w = angular velocity r = radius of circle of rotation in cm, and n = rpm /2/ Heparin or other isotonic anticoagulant /3/ "Mean corpuscular " /4/ When anticoagulant = 2 mg K oxalate/ml blood, mean and 95% range for 4BC = 45 (40-50), 5BC = 41 (36-45), 10BC = 35 0 (30-40), 12BC = 34 0 (30-[illegible]
micromet[illegible]
(13B) by f[illegible]
2"r(r+t)[illegible]
/9/ Calcu[illegible]
to water a[illegible]
culated fr[illegible]
iron is qu[illegible]
pH 7 4 /15/ Use of isotopic nitrogen Other methods in essential agreement

38. BLOOD ERYTHROCYTE, HEMATOCRIT, HEMOGLOBIN AND THROMBOCYTE VALUES, BIRTH TO MATURITY: MAN

	Age	Erythrocyte Count		Reticulocyte Count		Eryth. Packed Volume (Hematocrit)	Erythrocyte Volume[1]	Hemoglobin Concentration		Eryth. Hemoglobin Content[2]	Eryth. Hemoglobin Concentration[3]	Thrombocyte (Platelet) Count[4]	
		millions/mm^3		% of total erythrocytes		ml/100ml blood	μ^3	g/100ml blood		$\mu\mu g$	g/100ml Eryth.	thousands/mm^3	
		Value[5]	Range[6]	Value[5]	Range[6]	Value[5]	Value[5]	Value[5]	Range[6]	Value[5]	Value[5]	Value[5]	Range[6]
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
1	At birth[7]	5.7	4.8-7.1[c]	4.35	2.50-6.50[c]	56.6	106	21.5	18.0-27.0[c]	38	38.0	227	140-290[c]
2	First Day	5.6	4.7-7.0[c]			56.1	106	21.2	17.7-26.5[c]	38	37.8		
3	End 1st wk.	5.3	4.5-6.4[c]	1.12	0.10-4.50[c]	52.7	101	19.6	16.2-25.5[c]	37	37.2	235	150-320[c]
4	End 2nd wk.	5.1	4.3-6.0[c]	0.67	0.20-1.50[c]	49.6	96	18.0	14.5-24.2[c]	35	36.3	247	163-340[c]
5	End 3rd wk.	4.9	4.1-6.0[c]	0.63	0.20-1.30[c]	46.6	93	16.6	13.2-23.0[c]	34	35.6	267	177-367[c]
6	End 4th wk.	4.7	3.9-5.9[c]	0.73	0.10-1.00[c]	44.6	91	15.6	12.0-21.8[c]	33	35.0	280	185-390[c]
7	End 2nd mo.	4.5	3.8-5.8[c]	1.20	0.50-3.10[c]	38.9	85	13.3	10.8-18.0[c]	30	34.2	315	200-428[c]
8	End 4th mo.	4.5	3.8-5.3[c]	1.66	0.90-2.94[c]	36.5	79	12.4	10.2-15.0[c]	27	34.0	338	205-465[c]
9	End 6th mo	4.6	3.9-5.3[c]	1.38	0.72-2.30[c]	36.2	78	12.3	10.0-15.0[c]	27	34.0	340	205-470[c]
10	End 8th mo	4.6	4.0-5.4[c]	1.12	0.65-1.90[c]	35.8	77	12.1	9.8-15.0[c]	26	33.8	345	210-473[c]
11	End 10th mo.	4.6	4.0-5.5[c]	0.97	0.62-1.80[c]	35.5	77	11.9	8.4-14.9[c]	26	33.5	345	212-470[c]
12	End 12th mo.	4.6	4.0-5.5[c]	0.90	0.60-1.70[c]	35.2	77	11.6	9.0-14.6[c]	25	33.0	345	218-470[c]
13	End 2nd yr.	4.7	3.8-5.4[c]			35.5	78	11.7	9.2-15.5[c]	25	33.0		
14	End 4th yr.	4.7	3.8-5.4[c]			37.1	80	12.6	9.6-15.5[c]	27	34.0		
15	End 6th yr.	4.7	3.8-5.4[c]			37.9	80	12.7	10.0-15.5[c]	27	33.5		
16	End 8th yr.	4.7	3.8-5.4[c]			38.9	80	12.9	10.3-15.5[c]	27	33.2		
17	End 10th yr.	4.8	3.8-5.4[c]			39.0	80	13.0	10.7-15.5[c]	27	33.3		
18	End 12th yr.	4.8	3.8-5.4[c]			39.6	81	13.4	11.0-16.5[c]	28	33.8		
19	14 yrs. & over												
20	Males	5.4	4.6-6.2[b]			47[8,9,10]	87[9,10]	15.8	14.0-18.0[b]	29[10]	33.5[9]		
21	Females	4.8	4.2-5.4[b]			42[8,9,10]	87[9,10]	13.9	11.5-16.0[b]	29[10]	33.5[9]		
22	M & F Av.	5.1	4.2-6.2[b]	1.5	0.5 -3.8[c]	44.5[8,9]	87[9]	14.9		29[10]	33.5[9,10]	409[4]	273-545[b4]

/1/ = Mean Corpuscular Volume (M.C.V.). /2/ = Mean Corpuscular Hemoglobin (M.C.H.). /3/ = Mean Corpuscular Hemoglobin Concentration (M.C.H.C.) in %. /4/ Cutaneous blood. Direct method of Wood, Vogel, and Famulener except 22 LM = direct method of Rees-Ecker. /5/ Smoothed means from plotted curves. /6/ Smoothed sample ranges from plotted curves (except as noted). /7/ If cord clamped after placental separation, average 560,000 more erythrocytes per mm^3 and 2.6 g/100ml more hemoglobin during the first week of life than if cord clamped immediately after birth. Also in newborn, heel blood (=capillary) higher in erythrocytes and hemoglobin than blood from superior sagittal sinus. /8/ Centrifuged at 2000 g (3000 rpm) or over, for 10 min, after attaining constant packed cell volume. /9/ Heparin or other isotonic anticoagulant. /10/ Estimate "b" of 95% range: 40-54 for 20F; 37-47 for 21F; 70-94 for 20G, 74-98 for 21G; 25-34 for 20J; 24-33 for 21J; 23-35 for 22J; 30-40 for 22K.

39. BLOOD ERYTHROCYTE AND HEMOGLOBIN VALUES AT OR NEAR SEA LEVEL: MAN[1]

	Country	Place[2]	RBC Count millions/mm³ blood	Blood Hemoglobin Concentration g/100ml blood	Corpuscle Hb Content[3] µµg
	(A)	(B)	(C)	(D)	(E)
1	U. S.	Portland, Oregon	5.39	15.8	29.3
2	U. S.	*Portland, Oregon*	5.42	15.8	29.2
3	U. S.	New Orleans	5.85	15.9	27.2
4	U. S.	New Orleans	5.26	15.6	29.7
5	U. S.	Kansas	4.84	15.1	31.2
6	U. S.	Omaha	4.69	15.0	32.0
7	U. S.	Kansas	5.11	15.0	29.4
8	Argentina	Buenos Aires	5.50	15.4	28.0
9	Argentina	*Buenos Aires*	5.30	14.8	27.9
10	Denmark	Copenhagen	5.07	15.0	29.6
11	Germany	Jena	5.06	16.0	31.6
12	Germany	Giessen	4.96	16.0	32.3
13	Hawaii	Honolulu	5.08	15.1	29.7
14	India	Calcutta	5.36	14.8	27.6
15	India	Bombay	5.11	15.4	30.1
16	Norway	*Oslo*	5.52	16.2	29.3
17	Peru	Lima	5.26	15.7	29.8
18	Peru	Lima	5.14	16.0	31.1
19	Summary, U. S.[4]		5.22	15.5	29.7
20	Summary, all countries		5.22	15.5	29.7

/1/ Males. /2/ Altitudes of less than 0.4 Km. /3/ Mean Corpuscular Hemoglobin (M.C.H.). /4/ *For standards see Table 37.*

40. BLOOD ERYTHROCYTE AND HEMOGLOBIN VALUES AT ALTITUDE: MAN[1]

Residents (R); Sojourners (S).

	Country	Place	Altitude Km		RBC Count millions/mm³ blood		Blood Hemoglobin Concentration g/100ml blood	Corpuscle Hb Content[2] μμg
	(A)	(B)	(C)		(D)		(E)	(F)
1	Sea Level[3,4]		<0.4	R	5.22	R	15.5	29.7
2	Argentina	Tucuman	0.4	R	5.31	R	16.1	30.3
3	Canada	Saskatchewan	0.5	R	5.52	R	15.6	28.3
4	Switzerland	Zurich	0.5	R	5.00	R	15.0	30.0
5	U. S.	Denver, Colo.	1.5	R	5.42	R	16.5	30.4
6	So. Africa	Johannesburg	1.8	R	5.99	R	14.7	24.5
7	Mexico	Mexico City	2.3	R	7.35	R	18.4	25.0
8	Mexico	Mexico City	2.3	R	5.38	R	17.7	32.9
9	Chile	Chuquicamata	2.8	S	5.24	S	15.9	30.3
10	Chile	Ollague	3.7	S	5.54	S	17.0	30.7
11	Peru	Oroya	3.7	R	5.67	R	18.8	33.2
12	Argentina	Mina Aguilar	4.5	R	6.46	R	19.4	30.0
13	Peru	Morococha	4.5	R	6.15	R	20.8	33.8
14	Chile	Montt	4.7	S	5.84	S	17.6	30.1
15	Chile	Quilcha	5.3	R	7.37	R	22.6	30.7
16	Chile	Quilcha	5.3	S	5.95	S	18.4	30.9
17	Chile	Punta	6.1	S	5.77	S	18.3	31.7
18	India	Nanga Parbat	7.0	S	8.10	S	24.7	30.5

/1/ Males. /2/ Mean Corpuscular Hemoglobin (M.C.H.). /3/ Altitudes of less than 0.4 Km
/4/ For standards see Table 37.

41. BLOOD ERYTHROCYTE VALUES IN PREGNANCY AND POSTPARTUM: MAN

	Variable	Second Trimester Value and Range			Third Trimester Value and Range			During Labor	Postpartum Value and Range	
		4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	Value and Range	10 Days	42 Days
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
1, 2	RBC Count (millions/mm³ blood)	4.5 3.8-5.2^b	4.3 3.7-5.0^b	4.0 3.5-4.8^b	4.0 3.5-4.8^b	4.1 3.5-4.8^b	4.2 3.7-5.0^b	4.4 4.0-5.0^b	4.5 4.0-5.0^b	4.8 4.2-5.4^b
3, 4	Packed RBC Volume (Hematocrit) (ml/100 ml blood)	40 35-45^b	39 34-44^b	37 32-42^b	37 32-42^b	37.5 33-43^b	37.5 33-43^b	39 34-44^b	40 35-45^b	42.5 37-47^b
5, 6	Blood Hemoglobin Concentration (g/100 ml blood)	12.8 11.4-15.0^b	12.2 10.8-14.6^b	11.4 10.2-14.0^b	11.4 10.2-14.0^b	11.6 10.4-14.2^b	12.0 10.8-14.4^b	12.6 11.2-15.0^b	12.8 11.4-15.4^b	13.8 12.0-16.0^b
7	RBC Hemoglobin Concentration (g/100 ml RBC)	32	31	31	31	31	32	32	32	32.5
8	Corpuscle Hemoglobin Content (μμg)	28.4	28.4	28.5	28.5	28.3	28.5	28.6	28.4	28.7
9	Corpuscle Volume (μ³)	89	91	92	92	91	89	89	89	89

42. BLOOD ERYTHROCYTE VALUES: MAMMALS, LABORATORY

	Animal	RBC Count millions/mm³blood		Reticulocytes % of total RBC		Corpuscle Diameter μ		Corpuscle Volume μ³	
		Value	Range	Value	Range	Value	Range	Value	Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
1	Cat	8.0	6.5-9.5	0.2		6[2]	5-7[2]	57	51-63
2	Dog	6.3	4.5-8	0.7	0-2.7	7[2]	6.2-8.0[2]	66	59-68
3	Guinea pig	5.6	4.5-7	0.9	0.4-1.8	7.4[2]	7.0-7.5[2]	77	71-83
4	Mouse	9.3	7.7-12.5	4.0		6[2]		49	48-51
5	Rabbit	5.7	4.5-7	2.2	2-3	7.5[3]	6.5-7.5[2]	61	60-68
6	Rat	8.9[1]	7.2-9.6[1]	2.9	0.6-4.9	7.5[3]	6.0-7.5[2]	61	57-65

	Animal	Packed RBC Volume (Hematocrit) ml/100ml blood		Blood Hemoglobin Conc. g/100ml blood		Corpuscle Hemoglobin Conc. g/100ml RBC		Corpuscle Hemoglobin Content μμg	
		Value	Range	Value	Range	Value	Range	Value	Range
	(A)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
1	Cat	40.0	28-52	11.2	7.0-15.5	28	23-31	14	12-16
2	Dog	45.5	38-53	14.8	11.0-18.0	33	30-35	23	21-25
3	Guinea pig	42.0	37-47	14.4	11-16.5	34	33-35	26	24.5-27.5
4	Mouse	41.5		14.8	10-19	36	33-39	16	15.5-16.5
5	Rabbit	41.5	33-50	11.9	8.0-15.0	29	27-31	21	19-23
6	Rat	46.0[1]	39-53[1]	14.8	12-17.5	32	30-35	17	15-19

/1/ More weight given to common strains. /2/ Dry film. /3/ In plasma.

43. BLOOD HEMATOCRIT AND HEMOGLOBIN VALUES: VERTEBRATES[1]

	Animal	Packed RBC Volume (Hematocrit)[2] ml/100ml blood		Blood Hemoglobin Concentration g/100ml blood		RBC Hemoglobin Concentration g/100ml blood
		Value	Range	Value	Range	Value
	(A)	(B)	(C)	(D)	(E)	(F)
1	Man	44.5[4]		14.9[5]		33.5
2	Chimpanzee	41.5		13.0		31
3	Cow	40	33-47[b3]	11.5	8.7-14.5[b3]	29
4	Goat	34	20-50[b]	10.6	7.3-14[b3]	31
5	Hamster	46	36-54[c]	13.9	11-17.4[c]	30
6	Horse	33.4	28-42[b3]	11.1	8-14[b3]	33
7	thoroughbred	42		13.9		33
8	Monkey, rhesus	42	32-52[b3]	12.6	10-16	30
9	Pig	41.5	30-53[b3]	13.3	10-16.5[b3]	32
10	Sheep	32	22-40[b3]	12.6	10-15.5[b3]	39
11	Chicken	32		11.2[6]		35
12	Duck	39.5		14.8	9-21[b3]	37
13	Goose	44		12.8		29
14	Pigeon	42.5		15.3		36
15	Turkey	38		11.2		29
	Fish					
16	carp	31.3	21-40[b]	10.5	9.4-12.4[b]	34
17	mackerel	51.5		14.5		28
18	trout	27.2	22-36[b]	8.5	6.2-11.5[b]	31
	Frog					
19	Rana catesbeiana	30		7.8		26
20	Rana pipiens				10-12	
21	Snake, garter	28		8.6		31
22	Turtle, box	25	21-27[b]	7.2	6.1-9.1[b]	29

/1/ See Table No. 42. /2/ Determined by centrifugation under standard conditions. /3/ Standard deviation from which this range is calculated is from a subgroup whose mean is averaged with one or more others to obtain the value as presented. /4/ Average for both sexes. Hematocrit for males 47, range = 40-54[b]; females = 42, range = 37-47[b]. /5/ Average for both sexes. Hb for males = 15.8, range = 14-18[b]; females = 13.9, range = 11.5-16[b]. /6/ Average for both sexes. Hb for cocks = 12.9, hens = 9.4.

44. BLOOD ERYTHROCYTE VALUES: FISH

	Animal	RBC Count	Hematocrit	Hemoglobin[1]	RBC Diameters	RBC Volume
		millions/mm³ blood	ml/100ml blood	g/100ml blood	μ	μ³
	(A)	(B)	(C)	(D)	(E)	(F)
1	Bullhead (Ameiurus nebulosus)	1.8	26	14.7		
2	Carp (Cyprinus carpio)	0.84	31	10.5		311
3	Range:	0.65-1.13	21-40	9.4-12.4		278-340
4	Dogfish (Mustelus canis)	0.46	23.3	4.6	19.1 x 13.8	541
5	Dogfish (Squalus acanthias)	0.24	18.9	3.8	22.7 x 15.2	820
6	Eel (Anguilla bostoniensis)	2.4	36	9.3	12.3 x 8.1	149
7	Eel pout (Zoarces anguillaris)	2.04	20.8	4.0	10.4 x 8.7	102
8	Goosefish (Lophius piscatorius)	1.09	16.8	4.3	13.3 x 9.6	241
9	Hagfish (Myxine glutinosa)	0.15	22.2	4.6	26.4 x 18.3	1530
10	Lamprey eel (Petromyzon marinus)	0.33	23.5	5.8	14.3	710
11	Mackerel (Scomber scombrus)	3.9	46	14.2	12.0 x 8.3	118
12	Menhaden (Brevoortia tyrannus)	3.2		13.4	9.8 x 7.2	148
13	Pike (Esox lucius)	1.10	27			
14	Range:	0.40-1.37	16-33			
15	Puffer (Sphoeroides maculatus)	4.2		7.4	8.8 x 6.9	77
16	Sea robin, common (Prionotus carolinus)	2.5	24	7.1	9.8 x 6.5	95
17	Sea robin, Northern striped (Prionotus strigatus)	1.93	22.2	6.2	10.4 x 7.3	130
18	Shark sucker (Echeneis naucrates)	3.75	34	10.5	10.9 x 7.0	91
19	Skate, barndoor (Raja stabuliforis)	0.27	20.0	3.6	21.9 x 15.6	727
20	Skate, clearnose (Raja eglanteria)	0.30	24	4.5	23.7 x 14.4	823
21	Stingray (Dasyatis centrourus)	0.30	19	3.0	20.6 x 14.3	612
22	Sturgeon (Acipenser sturio)	0.43	21.5	5.0	14.0 x 9.7	506
23	Tautog (Tautoga onitis)	2.05		6.7	10.8 x 7.3	
24	Trout (Salvelinus fontinalis)	1.01	27	8.5		314
25	Range:	0.74-1.55	22.2-36	6.2-11.5		284-348

/1/ With Sahli hemoglobinometer except 2-3D and 24-25D where Evelyn photoelectric colorimeter was used.

45. ERYTHROCYTE DIAMETERS[1]: MAMMALS

	Animal (A)	Value (B)
1	Man	7 5
2	Anteater, giant (Myrmecophaga tridactyla)	9.2
3	Anteater, spiny (Tachyglossus aculeata)[2]	6 6
4	Ape, Barbary (Macaca sylvanus)	7 6
5	Ape, black, Celebes (Cynopithecus niger)	7.1
6	Armadillo, six-banded (Euphractus sexcinctus)	7.5
7	Ass (Equus asinus)	6.4
8	Babirussa (Babirussa babyrussa)[2]	5.8
9	Baboon (Papio doguera)[2]	7.4
10	Badger, honey (Mellivora capensis)	6.6
11	Badger, European (Meles meles)[2]	6 4
12	Badger, sand (Arctonyx collaris)[2]	7 0
13	Bandicoot, rabbit- (Thylacomys lagotis)[2]	6.5
14	Bat, big-eared (Plecotus auritus)	5.7
15	Bat, frosted (Vespertilio murinus)[2]	6.1
16	Bat, noctule (Nyctalus noctula)[2]	5 8
17	Bat, Rousette (Rousettus leachii)[2]	6.5
18	Bear, black (Ursus americanus)	6.9
19	Bear, European (Ursus arctos)	6.8
[illegible]	[illegible]	7.2
[illegible]	[illegible]	6.6
[illegible]	[illegible]	7.1
[illegible]	[illegible]	7.6
[illegible]	[illegible]	6 2
[illegible]	[illegible]	6 2
[illegible]	[illegible]	[illegible]
37	Civet, [illegible]	[illegible]
38	Coati, [illegible]	[illegible]
39	Cow, dc[illegible]	[illegible]
40	Deer, [illegible]	[illegible]
41	Deer, [illegible]	[illegible]
42	Deer, [illegible]	[illegible]
43	Dingo ([illegible]	[illegible]
44	Dog, do[illegible]	[illegible]
45	Elephar[illegible]	[illegible]
46	Elephar[illegible]	[illegible]
47	Elk (Ce[illegible]	[illegible]
48	Fox, bi[illegible]	[illegible]
49	Fox, fl[illegible]	[illegible]
50	Fox, re[illegible]	[illegible]
51	Gayal ([illegible]	[illegible]
52	Gibbon, [illegible]	[illegible]
53	Giraffe [illegible]	[illegible]
54	Gnu, wh[illegible]	[illegible]
55	Goat, d[illegible]	[illegible]
56	Guinea [illegible]	[illegible]
57	Hare, [illegible]	[illegible]
58	Hippop[illegible]	[illegible]

	Animal (A)	Value (B)
59	Hog-deer (Axis porcinus)	4.7
60	Hog, domestic (Sus scrofa)	6.0
61	Horse (Equus caballus)	5.5
62	Hyaena, striped (Hyaena striata)[2]	6.8
63	Hyrax, large-toothed (Procavia capensis)[2]	7.7
64	Kangaroo, great gray (Macropus giganteus)	7 6
65	Langur (Pygathrix aurata)[2]	7.3
66	Lemur, ring-tailed (Lemur catta)	6.5
67	Leopard, African (Felis pardus)[2]	5.9
68	Lion, African (Felis leo)	5.8
69	Loris, slender (Loris tardigradus)[2]	7.3
70	Marmoset (Callithrix jacckus)[2]	7.0
71	Marmot, hoary (Marmota caligata)[2]	7.3
72	Mole, European (Talpa europaea)	5.4
73	Mongoose, gray (Herpestes ichneumon)[2]	5.4
74	Monkey, capuchin (Cebus capucinus)	7.3
75	Monkey, leaf (Presbytis pyrrus)[2]	7.2
76	Monkey, red (Erythrocebus patas)[2]	7.5
77	Monkey, rhesus (Macaca mulatta)[2]	7.4
78	Monkey, spider, black (Ateles paniscus)[2]	7.1
79	Monkey, squirrel (Saimiri sciureus)[2]	6 8
80	Mouse, field, old world (Apodemus sylvaticus)[2]	6.6
81	Mouse, house (Mus musculus)	6.6
82	Nilgai (Boselaphus tragocamelus)[2]	5.2
83	Ocelot (Felis pardalis)	5.5
[illegible]	[illegible]	[illegible]

[illegible]

46. BLOOD ERYTHROCYTE VALUES IN FETUS, NEWBORN AND ADULT FEMALE: MAMMALS[1]

	Stage of Development	Man Value	Man Range	Cat Value	Cat Range	Cow Value	Cow Range	Goat Value	Goat Range	Pig Value	Pig Range	Rabbit Value	Rabbit Range	Rat Value	Rat Range	Sheep Value	Sheep Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
	R B C Count (millions/mm^3 blood)																
1	Fetus at Fraction of Term[2] 0.2									0.25	0.1-0.5						
2	0.3	1.1	0.3-2.2[c]			3.9	3.7-4.1[c]			0.63	0.2-1.3						
3	0.4	2.8	2.3-3.3[c]			4.8	4.5-5.3[c]			2.5	0.68-3.9					1.83	1.58-2.09[c]
4	0.5	2.3	2.2-3.3[c]			4.8	3.8-5.5[c]			2.9	2.0-4.0						
5	0.6	3.5	2.9-4.1[c]	2.22		5.5	4.4-6.4[c]			3.0	2.1-4.0	1.9	1.6-2.0[c]			5.1	
6	0.7			3.12	2.61-3.78[c]	5.2	4.2-6.2[c]			4.0	3.0-4.4	2.9	2.1-3.4[c]				
7	0.8			3.8	3.24-4.25[c]	5.9	5.4-8.0[c]			3.9	3.0-4.4	2.8	2.3-3.1[c]	0.98	0.7-1.2	8.1	
8	0.9					6.1	5.9-8.2[c]			4.16	4.0-4.3	3.7	2.9-4.3[c]	1.8	1.5-2.1	9.9	8.3-11.8[c]
9	Fetus at term[2]					6.8[5]	6.0-7.8[c,5]							2.2[6]	1.7-3.0[6]		
10	Newborn	4.8	3.8-6.0[c,3]	5.74[4]	5.16-6.14[4]					5.72[7]	5.51-5.91[7]	4.8[9]	3.3-5.5[c,9]	2.0[11]	1.4-2.9[11]		
11	Newborn									3.98[8]	2.62-5.26[8]	5.2[10]	4.4-5.8[c,10]	2.2[12]	1.6-2.8[12]		
12	Adult female	4.8	4.2-5.4[b]	6.6		8.05	6.1-10.7[c]			6.93		6.29		6.6		11.6	
	Hematocrit (ml/100ml blood)																
13	Fetus at Fraction of Term 0.2									6.6	3.6-10.6						
14	0.3	27	23-33[c]			37.7	34-40[c]	19		10.3	4.2-20.0						
15	0.4	33	29-44[c]			43.0	40-47[c]			26.2	10.2-33					27	25-29[c]
16	0.5	38	30-41[c]			36.7	28-45[c]	31	29-33[c]	27.4	23-35						
17	0.6	44	36-52[c]	28.0		40.4	32-50[c]	40		30.3	19.1-38	22.3	21-23[c]			37	
18	0.7			30.5	26-36[c]	37.0	32-44[c]	22		31.0	29-34	34.4	23-38[c]				
19	0.8			34.3	30-41	39.7	35-47[c]	32		32.4	29-36	32.0	28-37[c]	21.0		41.5	
20	0.9					31.0	30-32[c]	28.5	28-29[c]	34.5	33-38	30.5	24-34[c]	40.1	40-40.2	49	41-54[c]
21	Fetus at term[2]					35.9[5]	32-42[c,5]	27[6]									
22	Newborn	51.3	41-61[c,3]	39.3[4]	35-48[c,4]			33[10]	29-36[c,10]	39.6[7]	39-40[c,7]	44.1[9]	32-50[c,9]	25[11]	18.2-31[11]		
23	Newborn									25.0[8]	18-36[8]	50.0[10]	43-59[c,10]	20.6[12]	15.1-28[12]		
24	Adult female	42	37-47[b]	34.2		38.6	31-54[c]	50		40.8		39.8		39.4		34	
	Blood Hemoglobin Concentration (g/100ml blood)																
25	Fetus at Fraction of Term 0.2															4.0	2.8-4.8[c]
26	0.3	9.3	8.0-10.9[c]			8.5	7.7-9.1[c]	4.2		3.3	1.5-4.9					6.9	4.6-8.4
27	0.4	10.7	8.0-13.1[c]			10.9	10.3-11.4[c]			6.9	2.6-10.6					8.3	6.4-11.2
28	0.5	11.5	8.7-14.6[c]			8.5	6.9-9.7[c]	7.1	5.2-9.1[c]	6.8	4.9-11.2					9.2	7.9-10.3
29	0.6	13.6	11.0-14.7[c]	7.9		9.6	7.7-11.2[c]	10.1		8.1	5.2-9.7	7.3	7.1-7.7[c]	5.1	5.0-5.3	10.7	8.7-12.8
30	0.7			9.1	7.5-10.7[c]	9.7	8.3-12.1[c]	9.0		7.0	6.5-9.6	9.6	7.7-11.1[c]	7.6	6.1-9.2	11.2	8.8-13.4
31	0.8			10.1	9.3-11.2[c]	9.8	8.8-11.5[c]	10.4		8.7	7.6-9.6	8.8	10.1-11.0[c]	8.5	7.5-9.3	11.9	10.2-13.6
32	0.9					8.4	8.3-8.5[c]	8.9	8.2-9.6[c]	9.3	8.8-9.7[c]	10.0	8.5-11.3[c]	8.2	7.4-9.1	12.6	8.5-17.0
33	Fetus at term[2]					9.6[5]	8.5-10.8[c,5]	9.4[6]				12.4[6]	12.2-12.8[c,6]			12.7[6]	9.0-17.5[6]
34	Newborn	17.9	13-22[c,3]	12.4[4]	9.6-15.1[c,4]			11.0[10]	9.9-12.4[c,10]	11.8[7]	11.8-12.0[c,7]	14.2[9]	11.0-15.7[c,9]	8.3[11]	6.3-10.5[11]		
35	Newborn									8.1[8]	5.4-10.1[8]	15.6[10]	13.7-18.1[c,10]	6.6[12]	4.6-9.0[12]		
36	Adult female	13.9	11.5-16.0[b]	11.8		12.9	9.2-18.3[c]	12.6		13.8		12.8		12.8		11.0	

/1/ Values quoted for adult female are not necessarily those of the mother. Additional values for man may be found in the table on Erythrocyte Values in Pregnancy and Postpartum: Man. /2/ Gestation period for man in days is 280, cat, 60, goat, 147, pig, 114; rabbit, 31; rat, 21; sheep 147. /3/ Cord or venous blood, capillary blood values may be up to 10% higher during the first week after birth. /4/ Age, 3-12 days. /5/ Probably by caesarian section. /6/ Caesarian section. /7/ Age: 1-12 hrs. /8/ Age 1-10 days. /9/ Age: 2-18 hrs. /10/ Age 24-48 hrs. /11/ Age, 1-7 days. /12/ Age, 8-14 days.

46. BLOOD ERYTHROCYTE VALUES IN FETUS, NEWBORN AND ADULT FEMALE MAMMALS (Concluded)

	Stage of Development	Man Value	Man Range	Cat Value	Cat Range	Cow Value	Cow Range	Goat Value	Goat Range	Pig Value	Pig Range	Rabbit Value	Rabbit Range	Rat Value	Rat Range	Sheep Value	Sheep Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
	Corpuscle Hemoglobin Content (μμg)																
37	Fetus at Fraction of Term[2] 0.2																
38	0.3	63	47-87[c]			21.3	20.5-22.0[c]			56	38-87						
39	0.4	40	35-48[c]			21.1	20.0-21.6[c]			27	19-40					40.5	
40	0.5	42	38-51[c]			18.6	17.5-20.2[c]			23	17-29						
41	0.6	39	33-45[c]	36		17.5	17.4-17.6[c]			27	21-35	44	35-46[c]			20.5	
42	0.7			28	24-38[c]	18.6	16.5-19.6[c]			25	19-31	35	27-48[c]				
43	0.8			27	23-30[c]	15.0	14.3-16.2[c]			22	20-38	36	31-47[c]	52		13.1	
44	0.9					13.9	13.4-14.3[c]			22.5	22-23	28	26-30[c]	32.5	31-34	12.8	12.3-13.1[c]
45	Fetus at term[2]					14.1[5]	13.7-14.5[c,5]										
46	Newborn	37.5	32-43[c]	22[4]	19-26[c,4]					21[7]	20-22[c,7]	30[9]	27-34[c,9]	43[11]	31-60[11]		
47										20[8]	16-22[8]	33[10]	27-34[c,10]	31[12]	24-36[12]		
48	Adult female	29	24-33[b]	18		15.7	14.2-18.5[c]			21		21		20		13	
	Corpuscle Volume (μ^3)																
49	Fetus at Fraction of Term[2] 0.2									244	204-361						
50	0.3	181	134-285[c]			93	91-97[c]			173	131-278						
51	0.4	131	113-150[c]			88	84-89[c]			100	80-149					151	119-184[c]
52	0.5	129	116-140[c]			77	74-83[c]			94	84-114						
53	0.6	125	116-136[c]	134		74	71-77[c]			101	85-112	120	113-133[c]			73	
54	0.7			99	94-103[c]	71	69-75[c]			101	95-107	122	108-154[c]				
55	0.8			91	81-97[c]	57	58-63[c]			80	77-98	113	99-123[c]	160		48	
56	0.9					51	49-53[c]			83	83-83	82	79-84[c]	159	157-160	49	43-55[c]
57	Fetus at term[2]					53[5]	50-54[c,5]										
58	Newborn	113	90-124[c]	68[4]	65-78[c,4]					69[7]	68-71[c,7]	94[9]	90-100[c,9]	126[11]	96-172[11]		
59										64[8]	59-69[8]	97[10]	89-102[c,10]	92[12]	77-110[12]		
60	Adult female	87	74-98[b]	51		50	47-54[c]			59		64		61		30	

/1/ Values quoted for adult female are not necessarily those of the mother Additional values for man may be found in the table on Erythrocyte Values in Pregnancy and Postpartum Man. /2/ Gestation period for man in days is 280, cat, 60, goat, 147, pig, 114, rabbit, 31; rat, 21, sheep 147. /4/ Age: 3-12 days. /5/ Probably by caesarian section. /7/ Age: 1-12 hrs. /8/ Age: 1-10 days /9/ Age, 2-18 hrs /10/ Age: 24-48 hrs. /11/ Age: 1-7 days. /12/ Age, 8-14 days.

47. ERYTHROCYTE OXYGEN CONSUMPTION[1]

	Animal		Blood (B); Cells (C) µl O_2/mg dry wt/hr. In Serum		Temperature of Measurement (°C)	Method
			In Serum	In Ringer or Saline		
	(A)		(B)	(C)	(D)	(E)
1	Man	B[4]		-0.015[2]	37	Chemical
2		B[4]	-0.018	-0.017[2]	37	Manometric
3		C[5]		-0.042[2]	37	
4		C[6]		-0.06[2]	37	
5	Alligator, American	C[4]	-0.113	-0.067[3]	25	Manometric
6	Chicken	B[4]	-0.35	-0.21[2]	38	Manometric
7		B[4]	-0.26		25	Chemical
8		C[6]		-0.18[2]	37	Manometric
9	Fish, puffer	C[6]	-0.227	-0.075[3]	20	Manometric
10	Fish, sea robin	C[6]			20	
11	Fish, toad	C[6]	-0.112		20	
12	Frog, bull	C[6]	-0.111	-0.051[3]	25	Manometric
13	Goose	B[4]	-0.72	-0.40[2]	37	Manometric
14		B[4]	-0.67	-0.44[2]	39	Chemical
15		B[4]	-0.25		25	
16	Rabbit	B[4]	-0.064	-0.028[2]	38	Manometric
17		B[4]	-0.062		37	
18		B[4]	-0.22	-0.049[2]	37	Chemical
19		B[4]			25	
20		C[7]		-0.024[2]	37	Manometric
21	Snake, garter	C[6]	-0.154	-0.081[3]	25	Manometric
22	Snake, water	C[6]	-0.173	-0.083[3]	25	
23	Turtle	C[6]		-0.06[2]	25	Manometric
24	Turtle, Blanding's	C[6]	-0.096	-0.067[3]	25	
25	Turtle, box	C[6]	-0.158	-0.081[3]	25	
26	Turtle, snapper	C[6]	-0.119	-0.075[3]	25	

/1/ The minus signs are a convention to indicate loss of the quantity of oxygen from the atmosphere in contact with the red corpuscles. All values calculated on the basis of water content of cells being 70% by weight. /2/ Ringer. /3/ Isotonic saline. /4/ Defibrinated. /5/ Washed, buffy coat removed. /6/ Washed cells of whole blood. /7/ Suspension of R B C.

48. ERYTHROCYTE CARBOHYDRATE METABOLISM

	Animal	Substrate[1]	Rate of Lactic Acid Formation[2]		Rate of Methemoglobin Reduction[3]	Enzymes Probably Involved in Utilization[4]
			Value	Range		
	(A)	(B)	(C)	(D)	(E)	(F)
1		-5	-2.6	-6.1 to 0.9[b]	0.06	
2		se	25.8	12.1-39.5[b]	0.77	Glycolytic enzymes[6]
3		ose	24.5	1.8-47.2[b]	0.79	
4	C	se	19.6	4.7-34.5[b]	0.47	
5		ose	-0.5	-4.0 to 3.0[b]	0.15	Unknown
6			4.3	-2.8 to 11.4[b]	1.07	Malic dehydrogenase, oxaloacetic acid decarboxylase
7		ate	8.9	1.1-16.7[b]	1.12	Malic dehydrogenase, oxaloacetic acid decarboxylase, fumarase
8		e			1.15	Lactic dehydrogenase
9			3.8	-0.1 to 7.1[b]	0.00	
10		e	21.0	13.9-28.1[b]	0.78	Glycolytic enzymes[6]
11		se	20.5	11.1-29.9[b]	0.86	
12		e	22.0	14.2-29.8[b]	0.69	
13	Dc	se	1.2	-0.6 to 3.0[b]	0.26	Unknown
14			17.4	4.5-30.3[b]	1.19	Malic dehydrogenase, oxaloacetic acid decarboxylase
15		te	33.8	19.1-48.5[b]	1.20	Malic dehydrogenase, oxaloacetic acid decarboxylase, fumarase
16					1.27	Lactic dehydrogenase
17			3.5	-0.4 to 7.4[b]	0.46	
18			48.7	28.3-69.1[b]	2.92	Glycolytic enzymes[6]
19		e	59.3	36.4-82.2[b]	3.07	
20			56.8	32.7-80.9[b]	2.80	
21	Rabb	e	13.5	7.4-19.6[b]	1.21	Unknown
22			38.3	24.2-52.4[b]	2.08	Malic dehydrogenase, oxaloacetic acid decarboxylase
23		e	44.5	29.4-59.6[b]	1.82	Malic dehydrogenase, oxaloacetic acid decarboxylase, fumarase
24					5.92	Lactic dehydrogenase

/1/ RBC is not able to utilize succinate. /2/ CO_2/hour/4ml of a 50% RBC suspension in Krebs-Ringer bicarbonate buffer under anaerobic conditions. /3/ gm of reduced Hb/hour/100ml of a 50% suspension of methemoglobin corpuscles (=treated with nitrite and then washed with 0.9% NaCl) in the presence of excess substrate. Rates are linear for hexoses in cat and dog cells but not for the hexoses in rabbit cells and for the metabolic intermediates in cat, dog, and rabbit cells except when expressed as the log of the methemoglobin concentration. /4/ Exclusive of methemoglobin reductase and of the pyridine nucleotide coenzymes which are probably utilized in methemoglobin reduction. /5/ Free or endogenous control. /6/ And possibly zwischenferment.

49. BLOOD LEUKOCYTE VALUES, BIRTH TO MATURITY: MAN[1]

	Age	Leukocytes Total[2]		Neutrophils Total		Neutrophils Band Forms[3]		Neutrophils Segmented Forms		Eosinophils		Basophils		Lymphocytes		Monocytes	
		Thousands/mm^3--% of total leukocytes[4]															
		Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
1 2	At Birth	18.1 100[6]	9.0-30.0	11.0 61	6.0-26.0 40-80	1.65 9.1		9.4 52		0.40 2.2	0.02-0.85	0.10 0.6	0-0.64	5.5 31	2.0-11.0	1.05 5.8	0.40-3.1?
3 4	End 12 hours[7]	22.8 100	13.0-38.0	15.5 68	6.0-28.0 40-80	2.33 10.2		13.2 58		0.45 2.0	0.02-0.95	0.10 0.4	0-0.50	5.5 24	2.0-11.0	1.20 5.3	0.40-3.6?
5 6	End 24 hours[7]	18.9 100	9.4-34.0[8]	11.5 61	5.0-21.0 40-75	1.75 9.2		9.8 52		0.45 2.4	0.05-1.00	0.10 0.5	0-0.30	5.8 31	2.0-11.5	1.10 5.8	0.20-3.1?
7 8	End 1 week[7]	12.2 100	5.0-21.0	5.5 45	1.5-10.0 25-65	0.83 6.8		4.7 39		0.50 4.1	0.07-1.10	0.05 0.4	0-0.25	5.0 41	2.0-17.0	1.10 9.1	0.30-2.7?
9 10	End 2 weeks[7]	11.4 100	5.0-20.0	4.5 40	1.0-9.5	0.63 5.5		3.9 34		0.35 3.1	0.07-1.00	0.05 0.4	0-0.23	5.5 48	2.0-17.0	1.00 8.8	0.20-2.4?
11 12	End 4 weeks[7]	10.8 100	5.0-19.5	3.8 35	1.0-9.0	0.49 4.5		3.3 30		0.30 2.8	0.07-0.90	0.05 0.5	0-0.20	6.0 56	2.5-16.5	0.70 6.5	0.15-2.0?
13 14	End 2 months[7]	11.0 100	5.5-18.0	3.8 34	1.0-9.0	0.49 4.4		3.3 30		0.30 2.7	0.07-0.85	0.05 0.5	0-0.20	6.3 57	3.0-16.0	0.65 5.9	0.13-1.8?
15 16	End 4 months[7]	11.5 100	6.0-17.5	3.8 33	1.0-9.0	0.45 3.9		3.3 29		0.30 2.6	0.07-0.80	0.05 0.4	0-0.20	6.8 59	3.5-14.5	0.60 5.2	0.10-1.5?
17 18	End 6 months[7]	11.9 100	6.0-17.5	3.8 32	1.0-8.5	0.45 3.8		3.3 28		0.30 2.5	0.07-0.75	0.05 0.4	0-0.20	7.3 61	4.0-13.5	0.58 4.8	0.10-1.3?
19 20	End 8 months[7]	12.2 100	6.0-17.5	3.7 30	1.0-8.5	0.41 3.3		3.3 27		0.30 2.5	0.07-0.70	0.05 0.4	0-0.20	7.6 62	4.5-12.5	0.58 4.7	0.08-1.2?
21 22	End 10 months[7]	12.0 100	6.0-17.5	3.6 30	1.0-8.5	0.40 3.3		3.2 27		0.30 2.5	0.06-0.70	0.05 0.4	0-0.20	7.5 63	4.5-11.5	0.55 4.6	0.05-1.2?
23 24	End 12 months[7]	11.4 100	6.0-17.5	3.5 31	1.5-8.5	0.35 3.1		3.2 28		0.30 2.6	0.05-0.70	0.05 0.4	0-0.20	7.0 61	4.0-10.5	0.55 4.8	0.05-1.1?

/1/ The data are from smoothed curves plotted from averages of means from the literature. Apparent discrepancies in addition are due to rounding off after calculations were made. /2/ Values in B are sums of values in D, J, L, N, P. /3/ Includes a small percentage of myelocytes during first several days after birth. /4/ The upper of the two numbers for each age represents thousands per mm^3, the lower, the percentage of cells of the given type relative to the total leukocyte count. /5/ Ranges are from smoothed curves plotted from averages of ranges from the literature. Range values are estimates of the 95% range, and may be regarded as conforming to type "d", i.e., common experience. Note that the range of counts and the range of percents for any given cell type and age are not mathematically related. /6/ Approximately 3 nucleated red cells per 100 leukocytes have been found at birth. /7/ Values and ranges within the first year are from fragmentary data. /8/ An extreme range of 3,600-45,000 has been observed.

49. BLOOD LEUKOCYTE VALUES, BIRTH TO MATURITY: MAN (Concluded)

	Age	Leukocytes Total[2]		Neutrophils Total		Neutrophils Band Forms[3]		Neutrophils Segmented Forms		Eosinophils		Basophils		Lymphocytes		Monocytes	
		Thousands/mm³--% of total leukocytes[4]															
		Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]	Value	Range[5]
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
25 26	End 2 years	10 6 100	6.0-17.0	3 5 33	1 5-8 5	0 32 3 0		3.2 30		0 28 2 6	0 04-0.65	0 05 0 5	0-0 20	6 3 59	3.0-9.5	0 53 5 0	0 05-1 07
27 28	End 4 years	9 1 100	5.5-15 5	3 8 42	1 5-8 5	0 27 3 0	0-1 0 0-10	3 5 39	1 5-7 5 16-60	0.25 2.8	0 02-0 65	0 05 0 6	0-0 20	4.5 50	2 0-8 0	0.45 5 0	0-0 8
29 30	End 6 years	8.5 100	5.0-14 5	4 3 51	1 5-8.0	0.25 3 0	0-1.0 0-10	4 0 48	1.5-7.0 16-60	0 23 2.7	0-0 65	0 05 0.5	0-0 20	3.5 42	1 5-7 0	0.40 4.7	0-0.8
31 32	End 8 years	8 3 100	4 5-13 5	4 4 53	1.5-8 0	0 25 3.0	0-1.0 0-10	4.1 50	1 5-7 0 16-60	0.20 2 4	0-0 60	0 05 0 6	0-0 20	3.3 39	1.5-6 8	0.35 4.2	0-0.8
33 34	End 10 years	8 1 100	4 5-13 5	4 4 54	1.8-8.0	0.24 3 0	0-1 0 0-10	4 2 51	1 8-7.0 16-60	0.20 2.4	0-0 60	0.04 0.5	0-0 20	3.1 38	1.5-6 5	0 35 4.3	0-0.8
35 36	End 12 years	8 0 100	4.5-13 5	4 4 55	1 8-8 0	0 24 3 0	0-1 0 0-10	4.2 52	1.8-7.0 16-60	0.20 2.5	0-0.55	0.04 0.5	0-0 20	3.0 38	1.2-6.0	0 35 4 4	0-0.8
37 38	End 14 years	7.9 100	4.5-13.0	4 4 56	1 8-8 0	0 24 3 0	0-1.0 0-10	4 2 53	1.8-7 0 16-60	0 20 2 5	0-0 50	0.04 0.5	0-0 20	2 9 37	1 2-5.8	0 38 4.7	0-0.8
39 40	End 16 years	7 8 100	4.5-13 0	4.4 57	1 8-8 0	0 23 3 0		4 2 54	25-70	0 70 2 6	0-0.50	0.04 0 5	0-0.20	2.8 35	1.2-5 2	0 40 5.1	0-0.8
41 42	End 18 years	7 7 100	4 5-12 5	4 4 57	1 8-7.7	0 23 3 0		4 2 54	25-70	0 20 2 6	0-0 45	0.04 0.5	0-0.20	2.7 35	1 0-5 0	0.40 5.2	0-0.8
43 44	End 20 years	7 5 100	4 5-11.5	4 4 59	1 8-7.7	0.23 3.0	0-0.7 0-6	4.2 56	1 8-7.0 37-75	0.20 2.7	0-0.45	0 04 0 5	0-0.20	2 5 33	1 0-4 8	0.38 5.0	0-0 8
45 46	End 21 years	7 4 100	4 5-11.0	4.4 59	1 8-7 7	0 22 3 0	0-0.7 0-6	4 2 56	1.8-7.0 37-75	0 20 2.7	0-0.45	0 04 0 5	0-0.20	2.5 34	1 0-4 8	0.30 4 0	0-0.8

50. BLOOD LEUKOCYTE VALUES AT ALTITUDE: MAN

Cell Type	At Sea Level[1]		At Altitude of 3,730 Meters[2]		At Altitude of 4,500 Meters[3]	
	Value	Range	Value	Range	Value	Range
(A)	(B)	(C)	(D)	(E)	(F)	(G)
1 Leukocytes, total, (per mm^3 bl)	6,800	3,480-14,840	6,500	3,400-9,600	6,900	4,700-10,900
2 Neutrophils, Segmented, %	55.1	38-70	52.8	32-79	49.9	25-71
3 Neutrophils, Band, %	2.6	0-6	5.0		3.0	0-6
4 Eosinophils, %	4.2	0-15	2.5	0-10	2.2	0-5
5 Basophils, %	0.6	0-2	0.1	0-3	0.2	0-2
6 Lymphocytes, %	29.8	18-49	34.8	11-54	39.4	21-62
7 Monocytes, %	7.2	2-14.5	4.9	0-9	5.5	1-13

/1/ Lima, Peru. /2/ Oroya, Peru. /3/ Morococha, Peru.

51. BLOOD LEUKOCYTE VALUES IN PREGNANCY AND POSTPARTUM: MAN

Cell Type	2nd-3rd month	4th-5th month	6th-7th month	8th-9th month	5th-9th week postpartum
(A)	(B)	(C)	(D)	(E)	(F)
1 Leukocytes, total	10,100	10,600	10,600	10,400	8,200
2 Leukocytes, range	5,000-15,000	5,500-15,500	5,500-15,500	5,500-15,500	4,500-11,900
3 Neutrophils, %	62.5	67.0	69.5	69.0	51.5
4 Eosinophils, %	2.0	2.0	1.5	1.5	3.0
5 Basophils, %	0.2	0.2	0.2	0.2	0.3
6 Lymphocytes, %	31.0	27.0	25.0	25.5	41.0
7 Monocytes, %	4.5	4.0	4.0	4.0	4.0

/1/ Venous blood. For values in non-pregnant woman, see Table 49.

52. BLOOD LEUKOCYTE VALUES[1]: CERTAIN LABORATORY ANIMALS

	Cell Types	Count per mm^3		% of Total		Count per mm^3		% of Total	
		Value	Range	Value	Range	Value	Range	Value	Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
		Cat				Rat			
1	Total Leukocytes	16,000	9,000-24,000[c]	(100%)		14,000	5,000-25,000[c]	(100%)	
2	Neutrophils	9,500	5,500-16,500[c]	59.5%	44-82%[c]	3,100	1,100-6,000[c]	22%	9-34%[c]
3	Eosinophils	850	200-2,500[c]	5.4	2-11[c]	300	0-700[c]	2.2	0-6[c]
4	Basophils	20	0-100[c]	0.1	0-0.5[c]	100	0-200[c]	0.5	0-1.5[c]
5	Lymphocytes	5,000	2,000-9,000[c]	31	15-44[c]	10,200	7,000-16,000[c]	73	65-84[c]
6	Monocytes	650	50-1,400[c]	4	0.5-7[c]	300	0-650[c]	2.3	0-5[c]
		Dog				Mouse			
7	Total Leukocytes	12,000	8,000-18,000[c]	(100%)		8,000	4,000-12,000[c]	(100%)	
8	Neutrophils	8,200	6,000-12,500[c]	68%	62-80%[c]	2,000	700-4,000[c]	25.5%	12-44%[c]
9	Eosinophils	600	200-2,000[c]	5.1	2-14[c]	150	0-500[c]	2	0-5[c]
10	Basophils	85	0-300[c]	0.7	0-2[c]	50	0-100[c]	0.5	0-1[c]
11	Lymphocytes	2,500	900-4,500[c]	21	10-28[c]	5,500	3,000-8,500[c]	68	54-85[c]
12	Monocytes	650	300-1,500[c]	5.2	3-9[c]	300	0-1,300[c]	4	0-15[c]
		Rabbit				Guinea Pig			
13	Total Leukocytes	9,000	6,000-13,000[c]	(100%)		10,000	7,000-19,000[c]	(100%)	
14	Neutrophils[2]	4,100	2,500-6,000[c]	46%	36-52%[c]	4,200	2,000-7,000[c]	42%	22-50%[c]
15	Eosinophils	180	0-400[c]	2	0.5-3.5[c]	400	200-1,300[c]	4	2-12[c]
16	Basophils	450	150-750[c]	5	2-7[c]	70	0-300[c]	0.7	0-2[c]
17	Lymphocytes	3,500	2,000-5,600[c]	39	30-52[c]	4,900	3,000-9,000[c]	49	37-64[c]
18	Monocytes	725	300-1,300[c]	8	4-12[c]	430	250-2,000[c]	4.3	3-13[c]

/1/ Values and ranges in this table are approximate averages of highly variable unweighted means and ranges from the literature. /2/ In rabbits and guinea pigs, cells classed as "neutrophils" include "pseudo-eosinophils," "amphophils," or "heterophils."

50. BLOOD LEUKOCYTE VALUES AT ALTITUDE: MAN

	Cell Type	At Sea Level[1]		At Altitude of 3,730 Meters[2]		At Altitude of 4,500 Meters[3]	
		Value	Range	Value	Range	Value	Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
1	Leukocytes, total, (per mm^3 bl)	6,800	3,480-14,840	6,500	3,400-9,600	6,900	4,700-10,900
2	Neutrophils, Segmented, %	55.1	38-70	52.8	32-79	49.9	25-71
3	Neutrophils, Band, %	2.6	0-6	5.0		3.0	0-6
4	Eosinophils, %	4.2	0-15	2.5	0-10	2.2	0-5
5	Basophils, %	0.6	0-2	0.1	0-3	0.2	0-2
6	Lymphocytes, %	29.8	18-49	34.8	11-54	39.4	21-62
7	Monocytes, %	7.2	2-14.5	4.9	0-9	5.5	1-13

/1/ Lima, Peru /2/ Oroya, Peru. /3/ Morococha, Peru.

51. BLOOD LEUKOCYTE VALUES IN PREGNANCY AND POSTPARTUM: MAN

	Cell Type	2nd-3rd month	4th-5th month	6th-7th month	8th-9th month	5th-9th week postpartum
	(A)	(B)	(C)	(D)	(E)	(F)
1	Leukocytes, total	10,100	10,600	10,600	10,400	8,200
2	Leukocytes, range	5,000-15,000	5,500-15,500	5,500-15,500	5,500-15,500	4,500-11,900
3	Neutrophils, %	62.5	67.0	69.5	69.0	51.5
4	Eosinophils, %	2.0	2.0	1.5	1.5	3.0
5	Basophils, %	0.2	0.2	0.2	0.2	0.3
6	Lymphocytes, %	31.0	27.0	25.0	25.5	41.0
7	Monocytes, %	4.5	4.0	4.0	4.0	4.0

/1/ Venous blood. For values in non-pregnant woman, see Table 49.

52. BLOOD LEUKOCYTE VALUES[1]: CERTAIN LABORATORY ANIMALS

	Cell Types	Count per mm³ Value	Count per mm³ Range	% of Total Value	% of Total Range	Count per mm³ Value	Count per mm³ Range	% of Total Value	% of Total Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
		Cat				Rat			
1	Total Leukocytes	16,000	9,000-24,000[c]	(100%)		14,000	5,000-25,000[c]	(100%)	
2	Neutrophils	9,500	5,500-16,500[c]	59.5%	44-82%[c]	3,100	1,100-6,000[c]	22%	9-34%[c]
3	Eosinophils	850	200-2,500[c]	5.4	2-11[c]	300	0-700[c]	2.2	0-6[c]
4	Basophils	20	0-100[c]	0.1	0-0.5[c]	100	0-200[c]	0.5	0-1.5[c]
5	Lymphocytes	5,000	2,000-9,000[c]	31	15-44[c]	10,200	7,000-16,000[c]	73	65-84[c]
6	Monocytes	650	50-1,400[c]	4	0.5-7[c]	300	0-650[c]	2.3	0-5[c]
		Dog				Mouse			
7	Total Leukocytes	12,000	8,000-18,000[c]	(100%)		8,000	4,000-12,000[c]	(100%)	
8	Neutrophils	8,200	6,000-12,500[c]	68%	62-80%[c]	2,000	700-4,000[c]	25.5%	12-44%[c]
9	Eosinophils	600	200-2,000[c]	5.1	2-14[c]	150	0-500[c]	2	0-5[c]
10	Basophils	85	0-300[c]	0.7	0-2[c]	50	0-100[c]	0.5	0-1[c]
11	Lymphocytes	2,500	900-4,500[c]	21	10-28[c]	5,500	3,000-8,500[c]	68	54-85[c]
12	Monocytes	650	300-1,500[c]	5.2	3-9[c]	300	0-1,300[c]	4	0-15[c]
		Rabbit				Guinea Pig			
13	Total Leukocytes	9,000	6,000-13,000[c]	(100%)		10,000	7,000-19,000[c]	(100%)	
14	Neutrophils[2]	4,100	2,500-6,000[c]	46%	36-52%[c]	4,200	2,000-7,000[c]	42%	22-50%[c]
15	Eosinophils	180	0-400[c]	2	0.5-3.5[c]	400	200-1,300[c]	4	2-12[c]
16	Basophils	450	150-750[c]	5	2-7[c]	70	0-300[c]	0.7	0-2[c]
17	Lymphocytes	3,500	2,000-5,600[c]	39	30-52[c]	4,900	3,000-9,000[c]	49	37-64[c]
18	Monocytes	725	300-1,300[c]	8	4-12[c]	430	250-2,000[c]	4.3	3-13[c]

/1/ Values and ranges in this table are approximate averages of highly variable unweighted means and ranges from the literature. /2/ In rabbits and guinea pigs, cells classed as "neutrophils" include "pseudo-eosinophils," "amphophils," or "heterophils."

53. BLOOD LEUKOCYTE RANGES: FARM ANIMALS

	Animal	Leukocytes	Neutrophils	Eosinophils	Basophils	Lymphocytes	Monocytes
		Thousands/mm^3 blood	Number/mm^3 blood				
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
1	Cattle	5-12[d]	1,200-4,800[d]	180-1,800[d]	0-100[d]	2,700-6,900[d]	150-1,800[d]
2	Goat	5-14[d]	2,100-3,350[d]	0-1,100[d]	0-600[d]	2,100-11,250[d]	50-600[d]
3	Horse	5-11[d]	3,000-6,900[d]	50-600[d]	0-100[d]	1,200-4,800[d]	100-1,450[d]
4	Sheep	4-10[d]	1,000-4,500[d]	50-700[d]	0-200[d]	2,500-7,000[d]	50-800[d]
5	Swine	7-20[d]	2,400-10,000[d]	50-2,000[d]	0-800[d]	3,200-12,000[d]	50-2,000[d]
6	Chicken	16-40[d]	4,000-16,000[d]	400-4,000[d]	200-1,600[d]	8,000-24,000[d]	1,000-6,000[d]

54. MORPHOLOGY OF BLOOD LEUKOCYTES AND PLATELETS: MAN[1]

	CYTOPLASM					NUCLEUS					
	Cell Type	Size µ	Granules	Relative Amount	Color	Shape	Position	Nuclear Membrane	Nucleoli	Chromatin Pattern	Parachromatin Pattern and Amount
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1	Band cell, Neutrophilic[2] (Regenerative)	10-15	Full component of specific granules, pink to rose-violet			Rod-like, or deeply indented no segmentation				Thickened chromatin strands form coarse chromatin masses with a few distinct interstices	Small amount; pale blue or pink, seen as distinct chinks between chromatin masses.
2	Granulocytes, segmented[2]		Full components of specific granules[3]			Polymorphonuclear, elongated, constricted					
3	(a) Neutrophilic	9-15	Specific granules are small, fine pink to rose-violet and irregularly distributed throughout cytoplasm	Abundant	Colorless or slightly acidophilic	(a) 2 or more lobes, normal maximum = 5.	Central or eccentric.	Thick, heavy	None visible	(a)(b) Thickened chromatin strands form coarse chromatin masses with a few distinct interstices.	(a)(b) Small amount; small irregular, but distinct chinks between chromatin masses.
4	(b) Eosinophilic		Specific granules are red and throughout cytoplasm			(b) 2 to 4 lobes					
5	(c) Basophilic		Specific granules are metachromatic, water soluble, vary in size, and may overlie nucleus; are irregularly distributed.			(c) Slightly indented or irregular; less lobulation than (a)(b)				(c) Chromatin pattern less distinct than (a)(b); smudged.	(c) Much less distinct than in (a)(b)

54. MORPHOLOGY OF BLOOD LEUKOCYTES AND PLATELETS: MAN (Concluded)

	Cell Type	Size μ	CYTOPLASM: Granules	CYTOPLASM: Relative Amount	CYTOPLASM: Color	NUCLEUS: Shape	NUCLEUS: Position	NUCLEUS: Nuclear Membrane	NUCLEUS: Nucleoli	NUCLEUS: Chromatin Pattern	NUCLEUS: Parachromatin Pattern and Amount
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
	Lymphocyte[2]										
6	Small	6-8	May or may not contain round, red, relatively large, but sparse azurophil granules; about 30-60% of lymphocytes present them	Usually form narrow band	Varying shades of pale to dark blue.	Round, oval, or reniform, slightly or deeply indented	Usually central or eccentric.	Thick, heavy.	None visible	Large coarse dark purple chromatin blocks blend imperceptibly with colorless or pale blue parachromatin, poor chromatin-parachromatin distinction.	Small amount in small lymphocyte pale-blue or colorless. Moderate amount in medium lymphocyte pale-blue or colorless but appears paler than small lymphocyte. No sharp distinction from chromatin.
7	Medium	8-14		Narrow band, or moderate amount							
8	Monocyte[2] [4] (Transitional or Blood mononuclear)	14-20	Contain very fine, irregularly distributed azurophilic granules which are so small that they are called "azurophil dust," are sometimes coarser	Abundant	Muddy blue or gray blue, occasionally vacuolated.	Usually reniform or horseshoe shaped. May be round or polylobular.	Usually eccentric.	Moderately thick		Network of slender to coarse chromatin threads, thickened at their junctions and forming definite but irregular interstices	Parachromatin more abundant than in lymphocytes and distinct from chromatin.
9	Thrombocyte[2] (Platelet)	1-5	Central group of azurophil granules comprise chromomere, azurophil granules spread throughout mass if fixed rapidly[5]	Believed to consist only of a fragment of megakaryocyte cell body.	Light blue Comprises hyalomere.	No nucleus.	--	--	--	--	--

/1/ Table applies only to elements as observed in ordinary air-dried smears after Romanowsky stains For characteristics of the corresponding elements as observed in tissue sections and moist smears, refer to Chapter 5, Maximow, A., & Bloom, W., "A Textbook of Histology " W. B. Saunders, Philadelphia, 1948. For characteristics of the corresponding elements as observed with the supravital technique, refer to Tompkins, E. H., & Cunningham, R. S., in Sections IX and X in Vol I of "Handbook of Hematology," Hal Downey, Editor Paul B Hoeber, New York, 1938. /2/ Nomenclature recommended by Committee for Clarification of the Nomenclature of Cells and Diseases of the Blood and Blood-forming Organs (Blood 4 89, 1949) /3/ Granular size, neutrophilic = 70x85 - 365x580mμ, eosinophilic = 750-135mμ in diameter basophilic = from as small as neutrophil granule to larger than eosinophil granule In any stage of development, specific granules of all granulocytes may overlie nucleus, they are clearly visible in basophils and eosinophils. /4/ Both cytoplasm and nucleus are usually more lymphocytic in non-human species /5/ 60-100 osmiophilic granules are seen under electron microscope.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1]

Cell Type (A)	Physical and Chemical Properties (B)	Chemical Contents and Stain Reactions: Nucleus and Cytoplasm (C)	Chemical Contents and Stain Reactions: Nucleus (D)	Chemical Contents and Stain Reactions: Cytoplasm (E)	Biological Properties and Functions (F)
	Physical Properties: Cell	Chemical Contents			
Leukocyte, Neutrophilic (granulocyte, *neutrophilic*, segmented)	Specific gravity = 1 065. *Migrate* towards anode. Cataphoretic velocity slower than lymphocytes Polarized, but may reverse direction. *Are sensitive* to irradiation[2]; particularly in hemopoietic tissues Constriction rings due to external factors[2]	Acid phosphatase[5]. Alkaline phosphatase[5]. Amylase. Catalase[6]. Cytochrome oxidase. Fibrinolysin Histamine. Lipase[7]. Nucleotidase Phosphorylase. Proteases: Adenosinase[2] Cathepsins Lysozyme[8]. Nuclease. Papainase. Peptidase. Tryptase (trypsin)[8]. Trephones. Verdoperoxidase.	Sulfur[10].	Cytoplasm proper: Glycogen (extra-granular cytoplasm). Ribonucleoprotein (little or none)[11]. Granules: Acid phosphatase. Cytochrome c oxidase. Iron-porphyrin-protein complexes Lipids[12]. Phospholipids Ribonucleic acid. Verdoperoxidase. Rich in low molecular weight compounds.	Possess ameboid and wormlike locomotion (28-34μ per minute). Show diapedesis and adhere to endothelium under stimulation. May show marked cytoplasmic budding. Exhibit chemotaxis positive and negative for about 1 mm distance. Retain integrity best in isotonic, slightly hypertonic, or slightly hypotonic solution. Fragility inversely proportional to ascorbic acid content. Phagocytic for bacteria, quite commonly for blood, tissue cells, debris, antigen-antibody compounds, and foreign bodies. Phagocytic ability proportional to ascorbic acid content. Phagocytosis enhanced by opsonins and bacteriotropins. Phagocytosis increased by coagulase. Migrate into areas of inflammation, especially acute. Elaborate soluble, antigenically active material from particulate antigens[9]. Associated with complement formation[4]. Associated with complement formation[2]. Produce agglutinins[2]. Agglutinated by coagulase. Are source for oxidase effusion. Are source for verdoperoxidase. High oxygen consumption. High glycolytic activity. Digest fibrin. Post mitotic. Extravascular maturation. Life span in blood 0 5 to 5 days[2]. Disintegrate to "pus corpuscles." Disappear quickly in tissue culture explants.
	Physical Properties: Granules				
	Slightly refractile. Little or no electron-scattering hull Active flowing during movement of cell.				
	Chemical Properties	Stain Reactions			
	Are very sensitive to moderate pH changes from normality. Are very sensitive to benzene and related compounds; sensitivity may be property of regenerative not of adult forms Adult forms more resistant to HN[2] than regenerative forms. Respond to leukotaxine. Exhibit chemotaxis[3]. Exhibit oxidase effusion. High glycolytic activity. Reduce potassium tellurite.	Sudan black B positive Acridine orange positive.	Feulgen positive.	Granules: Acid fast. Nile blue sulphate positive. Sudan III positive. Stain red-lilac with Wright's stain. Stain violet with Ehrlich's "triacid" stain. Sudan black B positive Acid hematein positive. Neutral red positive. Non-specific tannophil granules.	

/1/Statement of a positive finding in *this* table does not necessarily imply a negative finding in the same respect *elsewhere* in the table. /2/Questioned. /3/Inhibited by leukocidins; decreased by alcohol. Positive chemotaxis of *leukocytes:* cellulose, starch, glycogen, glucose, maltose, levulose, fructose, absorbent cotton. No chemotaxis: *olive oil*, various inorganic salts, oleic acid, Na, K, Mg, and Ca palmitate, stearic acid, carbon, quartz, glass, washed MnO_2, non-absorbent cotton, raw cotton. Negative chemotaxis: aluminum *oxide*. /4/Less than lymphocytes. /5/Contain major portion of alkaline phosphatases of white cell suspensions /6/Trace. /7/May be a common esterase. /8/Present in significant amounts *only* in rabbit neutrophils /9/In cats; in man found in exudates rich in neutrophilic segmented cells. /10/Nucleus contains 1.8% sulfur. /11/Amount decreases with maturation. /12/Extractable with acetone.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type	Physical and Chemical Properties	Chemical Contents and Stain Reactions: Nucleus and Cytoplasm	Chemical Contents and Stain Reactions: Nucleus	Chemical Contents and Stain Reactions: Cytoplasm	*Biological Properties and Functions*
(A)	(B)	(C)	(D)	(E)	(F)
Leukocyte, Eosinophilic (granulocyte, eosinophilic, segmented).	**Physical Properties**	**Chemical Contents**			Possess ameboid locomotion, but are usually slower than *neutrophils* (5 8-9μ per minute).[14] *Occasionally travel very rapidly in* supravital preparations. Migrate into areas of *inflammation*[15]. Phagocytic (usually less than neutrophils). Transport anaphylactogenic substance (antigen). Source of blood histamine[2]. Cells are slowly affected by *anisotonia* ("hardy" cells). *Extravascular maturation.* Survive 10 days or more in vitro.
	Core of granules offers *little resistance to electrons.*	Amylase[2] Cytochrome oxidase. *Histamine*[2]. Lipase[2] Papainase. Tryptase[2]. Verdoperoxidase	Alkaline phosphatase.	Cytoplasm proper: Glycogen (*extragranular*)[2]. Mucopolysaccharide (neutral)[2]. Granules: Acid phosphatase. Cytochrome c oxidase. *Iron.* Iron-porphyrin-*protein complex.* Histamine[2]. *Phospholipids.* Tyrosine. *Verdoperoxidase.* Core rich in low molecular weight compounds.	
	Chemical Properties	**Stain Reactions**			
	Form Charcot-Leyden crystals[13] Nucleus selectively dissolved with wetting agents	Acridine orange positive	Feulgen positive.	Granules: *Sudan III positive.* Sudan black B: *positive for hull,* negative for core. *Nile blue sulphate positive.* *Acid hematein:* positive for core, *negative for hull.* Neutral red positive. Eosin positive.	

/1/Statement of a positive finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned. /13/Probably nuclear in origin. Crystals are hexagonal pyramids with bases opposed. /14/*Rate depends upon site and surface.* /15/Especially inflammation due to parasites, repeated foreign protein allergy, epidermal destruction, and tumors; *also subacute and chronic inflammations.*

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type (A)	Physical and Chemical Properties (B)	Chemical Contents and Stain Reactions: Nucleus and Cytoplasm (C)	Nucleus (D)	Cytoplasm (E)	Biological Properties and Functions (F)
Tissue Eosinophil[16]		*Chemical Contents*			
		No acid phosphatase.		Cytoplasm proper: No ribonucleoprotein. No glycogen. Granules: Alkaline phosphatase[2]. No glycogen.	
		Stain Reactions			
			Feulgen positive	Cytoplasm proper: HIO_4-Schiff (PAS) positive. Sudan III positive. Granules: HIO_4-Schiff (PAS) positive. Sudanophilic. Stain green with thionine.	
Leukocyte, Basophilic (granulocyte, segmented).	*Physical Properties*	*Chemical Contents*			Possess ameboid locomotion (slower than neutrophils or eosinophils). Migrate into areas of inflammation. Phagocytic[18]. May produce heparin. Post mitotic. Extravascular maturation.
	More resistant to irradiation than other granulocytes.			Granules: Oxidase. Glycogen[2]. Peroxidase[2]. Lipid. Phospholipids.	
	Chemical Properties	*Stain Reactions*			
	Granular metachromatic material is soluble in aqueous solutions. Positive chemotaxis to egg albumin	Sudan III positive. Sudan black B positive[2]. Acridine orange positive.	Feulgen positive	Granules: Show metachromasia. HIO_4-Schiff (PAS) positive. Acid hematein[17].	

/1/ Statement of a positive finding in this table does not necessarily imply a negative finding in the *same respect elsewhere in the table*. /2/ Questioned. /16/ May be identical with blood eosinophil /17/ Variable. /18/ Selective and rare.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type	Physical and Chemical Properties	*Chemical Contents* and Stain Reactions			*Biological Properties* and Functions
		Nucleus and Cytoplasm	Nucleus	Cytoplasm	
(A)	(B)	(C)	(D)	(E)	(F)
Leukocyte, Eosinophilic (granulocyte, *eosinophilic*, segmented).	**Physical Properties**	**Chemical Contents**			Possess ameboid locomotion, but are usually slower than neutrophils (5 8-9$_\mu$ per minute).[14] Occasionally travel very rapidly in supravital preparations. Migrate into areas of *inflammation*[15]. Phagocytic (usually less than neutrophils). Transport anaphylactogenic substance (antigen). Source of blood *histamine*[2]. Cells are slowly affected by anisotonia ("hardy" cells). *Extravascular maturation.* Survive 10 days or more in vitro.
	Core of granules offers little resistance to electrons	Amylase[2]. Cytochrome oxidase. *Histamine*[2]. Lipase[2] Papainase *Tryptase*[2] *Verdoperoxidase.*	Alkaline phosphatase.	<u>Cytoplasm proper:</u> Glycogen (extragranular)[2]. Mucopolysaccharide (neutral)[2]. <u>Granules:</u> *Acid phosphatase.* Cytochrome c oxidase. *Iron* Iron-porphyrin-*protein complex.* Histamine[2]. Phospholipids. *Tyrosine.* Verdoperoxidase. Core rich in low molecular weight compounds	
	Chemical Properties				
	Form Charcot-Leyden crystals[13] Nucleus selectively dissolved with wetting agents	**Stain Reactions**			
		Acridine orange *positive*	Feulgen positive.	<u>*Granules:*</u> Sudan III positive. Sudan black B: positive for *hull*, negative for core. Nile blue sulphate *positive.* Acid hematein: positive for core, negative for hull. Neutral red positive. Eosin positive.	

/1/Statement of a positive finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned. /13/*Probably nuclear in origin. Crystals are hexagonal pyramids with bases opposed.* /14/Rate *depends* upon *site and surface.* /15/*Especially* inflammation due to parasites, repeated foreign protein allergy, epidermal destruction, and tumors; also subacute and chronic *inflammations.*

55 PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type	Physical and Chemical Properties	Chemical Contents and Stain Reactions: Nucleus and Cytoplasm	Nucleus	Cytoplasm	Biological Properties and Functions
(A)	(B)	(C)	(D)	(E)	(F)
Tissue Eosinophil[16]		*Chemical Contents:* No acid phosphatase.		*Chemical Contents:* Cytoplasm proper: No ribonucleoprotein; No glycogen. Granules: Alkaline phosphatase[2]. No glycogen	
		Stain Reactions:	Feulgen positive.	*Stain Reactions:* Cytoplasm proper: HIO_4-Schiff (PAS) positive; Sudan III positive. Granules: HIO_4-Schiff (PAS) positive. Sudanophilic; Stain green with thionine	
Leukocyte, Basophilic (granulocyte, segmented).	*Physical Properties:* More resistant to irradiation than other granulocytes	*Chemical Contents:*		*Chemical Contents:* Granules: Oxidase; Glycogen[2]; Peroxidase[2]. Lipid; Phospholipids	Possess ameboid locomotion (slower than neutrophils or eosinophils). Migrate into areas of inflammation. Phagocytic[18]. May produce heparin. Post mitotic. Extravascular maturation.
	Chemical Properties: Granular metachromatic material is soluble in aqueous solutions. Positive chemotaxis to egg albumin	*Stain Reactions:* Sudan III positive. Sudan black B positive[2]. Acridine orange positive	Feulgen positive	*Stain Reactions:* Granules: Show metachromasia. HIO_4-Schiff (PAS) positive. Acid hematein[17].	

/1/Statement of a positive finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned /16/ May be identical with blood eosinophil /17/ Variable /18/ Selective and rare

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type	Physical and Chemical Properties	Chemical Contents and Stain Reactions			Biological Properties and Functions
		Nucleus and Cytoplasm	Nucleus	Cytoplasm	
(A)	(B)	(C)	(D)	(E)	(F)
Tissue Mast Cell	Granules more soluble in water than blood basophil granules[19]. Resistant to ribonuclease digestion. Exhibit chemotaxis, especially to egg albumin.	Chemical Contents			Phagocytosis: very limited. Do not store dye particles. Exhibit chemotaxis. Can shed granules. Associated with heparin metabolism[2]. Release heparin[22]. May arise heteroplastically from lymphocytes, plasma cells, clasmacytes, histiocytes through endogenous elaboration of mast granules. Mitotic figures are rarely seen.
			No acid or alkaline phosphatase[1].	Cytoplasm proper: Heparin[1]. Cytoplasm and granules: Heparin. No lipase[2]. No verdoperoxidase[2]. No free iron[2]. No glycogen[2]. No nucleic acid[2]. Granules: Acid mucopolysaccharide[2]. Acid phosphatase. Alkaline phosphatase. Cytochrome oxidase. Heparin[2]. Monosulfuric acid mucopolysaccharide[20]. Granules chemically not related to mucin or pigment cell granules. Golgi area: Acid phosphatase.	
		Stain Reactions			
			Feulgen positive.	Cytoplasm: Show metachromasia with toluidin blue[2,21]. Granules: Show metachromasia with thionine, toluidin blue, and methylene blue[2]. Are sudanophilic. Stain with pyronin. Methylene blue positive	

/1/Statement of a positive finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned. /19/Less soluble in rat and mouse than in man. /20/Changes to di-, tri-, and tetra- in plasma. /21/Metachromasia resistant to hyaluronidase digestion. /22/May be by granular solution and vacuolation.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type	Physical and Chemical Properties	Chemical Contents and Stain Reactions			Biological Properties and Functions
		Nucleus and Cytoplasm	Nucleus	Cytoplasm	
(A)	(B)	(C)	(D)	(E)	(F)
	Physical Properties	Chemical Contents			
Lymphocyte.	Cataphoretic velocity slightly higher than that of neutrophils and of thrombocytes Very sensitive to irradiation and HN_2, particularly in hemopoietic tissues[23].	Adenosinase. Acid phosphatase[25] Alkaline phosphatase. Amylase[2] Cathepsin. No cytochrome oxidase (*neg* in blood). Esterase (low) Gamma globulin[1]. Lipase[2]. Lysozyme Nucleinase. Purine-nucleosidase.	Chromasin complex. Nucleohistone. Desoxyribose*nucleic* acid.	Cytoplasm proper: Ribonucleoprotein (basophilia). Acid *hematein* negative Verdoperoxidase (neg. in blood; may be pos in field of inflammation). Granules: Glycogen[1,26]. Mitochondria: Nucleoproteins Phospholipids[27]. Cytocentrum (Golgi zone): Acid phosphatase.	Possess polarized ameboid rotary locomotion (15 to 30μ *per minute*). Phagocytic for bacteria, yeast, blood, and tissue cells[2]. Phagocytic for vital dyes[29]. *Migrate* into areas of inflammation, into lumen of G. I. tract. May show marked cytoplasmic budding[28]. Cytoplasmic budding may be concurrent with rise *in* antibody titre[2]. Cells are relatively resistant in hypotonic solutions. Oxygen consumption less than that of granulocytes. Synthesize protein (globulin)[24]. Participate in antibody formation[30]. Trephocytic. Transform into monocytes[1], into plasma cells. Transform into histiocytes (macrophages) in inflammation and into macrophages, epithelioid cells, giant cells in tissue culture[2]. Form granulocytes[2]. Chromosome size varies with tissue and with age. Develop nuclear vacuoles during degeneration. Collagen deposition may be associated with lymphocyte disintegration. Sensitive to or killed by adrenal cortical extract, HN_2, or x-rays in vitro. Survive well at pH 6 0-8 0 in vitro. Survive best at 7-17° C. in vitro. Intermitotic. Life span in blood possibly less than 24 *hours*; in tissues, days or weeks.
	Chemical Properties	Stain Reactions			
	Are less sensitive than granulocytes to benzene and related compounds Synthesize *protein* (globulin)[24] Aerobic glycolysis: slight or none Glycolytic activity half or less than that of granulocytes Do not exhibit chemotaxis[2]	Lack stainable *lipoidal* substances in blood Stain with acridine orange.	Feulgen positive.	Cytoplasm proper: *Sudanophobic.* Granules: Iodophilic. Azurophil granules give negative HIO_4-*Schiff* (PAS) reaction. Cytocentrum[1] Occasional rosette of neutral red vacuoles near cytocentrum.	

/1/Statement of a *positive* finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned. /23/More sensitive in nodule than in the rest of the node. /24/Evidence of protein synthesis for "export" disputed. /25/Contain major portion of acid phosphatases in leukocyte suspensions. /26/Small amounts: 1/100 that of neutrophils. /27/ *Highly* soluble in alcohol. /28/ May be first step in disintegration. /29/May be due to permeation and segregation into vacuoles instead of phagocytosis /30/Directly or by *supplying* essential basic building blocks and by stimulating phosphorylation.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type	Physical and Chemical Properties	Chemical Contents and Stain Reactions: Nucleus and Cytoplasm	Chemical Contents and Stain Reactions: Nucleus	Chemical Contents and Stain Reactions: Cytoplasm	Biological Properties and Functions
(A)	(B)	(C)	(D)	(E)	(F)
Leukocytoid Lymphocyte (of infectious mononucleosis)		**Chemical Contents**			Possess depolarized locomotion[2]. Phagocytic for bacteria[2].
		No peroxidase. No glycogen[2].			
		Stain Reactions			
			Feulgen positive.	Cytoplasm proper: Methylene blue positive. Cytocentrum: Rosette of neutral red vacuoles about cytocentrum.	
Monocyte (Blood mononuclears).	Exhibit chemotaxis for about 25μ distance. Often oxidase positive.	**Chemical Contents**			Locomotion is depolarized. Phagocytic for bacteria, cellular debris, pigment, and parasites. Phagocytic for vital dyes[29]. Exhibit pinocytosis. May show cytoplasmic budding[32]. Migrate into areas of inflammation. Participate in antibody formation[1,33]. Transform into macrophages, epithelioid cells, giant cells, and possibly into fibroblasts. Extravascular maturation.
		No alkaline phosphatase[2]. Carbohydrase. Lipase. Nucleinase. Proteolytic enzymes. Verdoperoxidase.		Cytoplasm: Glycogen[2]. Granules: Lipids. Phospholipids.	
		Stain Reactions			
		Acridine orange positive.	Feulgen positive.	Cytoplasm: Droplets stain with sudan III[2]. Acid hematein positive. Droplets stain with Nile blue sulfate. Cytocentrum: Rosette of neutral red vacuoles[31]. Granules: Sudan III positive. Sudan black B positive.	

/1/Statement of a positive finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned. /29/May be due to permeation and segregation into vacuoles instead of phagocytosis. /31/Not specific. /32/May be first step in disintegration. /33/Possibly by elaborating soluble antigenically active material for particulate antigens.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type	Physical and Chemical Properties	Chemical Contents and Stain Reactions: Nucleus and Cytoplasm	Chemical Contents and Stain Reactions: Nucleus	Chemical Contents and Stain Reactions: Cytoplasm	...iological Properties and Functions
(A)	(B)	(C)	(D)	(E)	(F)
Histiocyte (Macrophage).	Do not exhibit chemotaxis[2]. Are less sensitive to lower pH than other leukocytes.	Chemical Contents			...on is depolarized[2]. ...ic for bacteria, cells, tissue, ...rasites as well as foreign ... ...ic for lipids and then called ...istiocytes" or "foam cells"[2] ...al dyes ...inocytosis ... as large scavenger cells of ...nation. ...into, or are activated in, ...f inflammation. ... resistant to external ... than other leukocytes[2]. ...te in antibody formation[2,33]. ...d with the intermediate me...n of blood and bile pigments, ...erol, and iron. ...n into epithelioid cells, for...dy type, or Langerhans type ...ells, and possibly into fibro... ...isform into plasma cells in ...ed animals.
		Carbohydrase. Lipase. Nuclease. Proteinases. No verdoperoxidase.			
		Stain Reactions			
			Feulgen positive.	Neutral red vacuoles are dispersed in cytoplasm or form rosette about cytocentrum[31]. Acid hematein positive.	
Megakaryocyte		Chemical Contents			May be phagocytic[2]. Possess slight motility. Form platelets by pseudopodial formation and disintegration of cytoplasm.
		Acid phosphatase. Alkaline phosphatase (low)		Cytoplasm: Ribonucleoprotein[2]. Granular glycogen[2]. Granules: Oxidase	
		Stain Reactions			
				Cytoplasm: Exhibits metachromasia. Acid hematein positive. Granules: Iodophilic. Mitochondria: Sudan black B positive	

/1/Statement of a positive finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned. /31/Not specific. /33/Possibly by elaborating soluble antigenically active material for particulate antigens.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type (A)	Physical and Chemical Properties (B)	Chemical Contents and Stain Reactions (CDE)			Biological Properties and Functions (F)
Platelet (Thrombocyte).	Physical Properties Are negatively charged. Cataphoretic velocity same as that of neutrophils. Chromomere traversed by ultra-violet rays. Chemical Properties Chromomere dissolves in acetic acid. Positive Bial's test in acid hydrolysates.	Chemical Contents Acid phosphomonoesterase; Ascorbic acid; Catalase[2]; Dopa-oxidase; Histamine[34]; Oxidase[2]; Peptolytic enzymes[35]; No verdoperoxidase; No phosphatase; Granular glycogen[2]; Lipids[36]: Phospholipids[37]; Cephalin, Free cholesterol, Cholesterol esters, Neutral fats, Ribonucleic Acid; Thromboplastin; Platelet accelerator factor; Vasoconstrictor substance; Hypotensive principle. Stain Reactions Acid hematein positive. Sudan black B positive. Feulgen negative[2]. Neutral red positive bodies.	Granules: Iodophilic	Chromomere: Methyl green negative. Hyalomere: Methyl green positive[2]. Pyronin negative[2].	Release thromboplastin in clotting. Release accessory (accelerator) clotting factors. Interact with plasma antihemophilic factor to form thromboplastin. Possess agglutinative function, are sticky and adhesive, and lend these properties to the clot Form capillary thrombi in test for bleeding time[38] when more than 30,000-60,000 per mm³. Adhere to microorganisms,[39] "platelet loading." Associated with coarsening and shortening of fibrin strands in syneresis. Liberate a vasoconstrictor substance. Liberate a hypotensive principle which is stronger than vasoconstrictor substance. Support capillary walls in tourniquet tests when more than 30,000-60,000 per mm³, and endothelial cells are normal[38]. In shed blood, transform into dendritic, then into expanded forms. In shed blood, contains fibrils which in turn are composed of spherules (50-200 millimicrons) disseminated into surrounding medium. Consists of bits of megakaryocyte cytoplasm. Oxygen consumption of platelets in man is 8 4 mm³ per mg per hr. Life span in blood is 3-5 days[2].

/1/Statement of a positive finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned. /34/In rabbits. /35/In horses. /36/15% of dried weight consists of lipids. /37/68% of phospholipids is cephalin. /38/Critical level in dispute. /39/ Varies with both mammalian and bacterial species involved.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Continued)

Cell Type	Physical and Chemical Properties	Chemical Contents and Stain Reactions: Nucleus and Cytoplasm	Chemical Contents and Stain Reactions: Nucleus	Chemical Contents and Stain Reactions: Cytoplasm	Biological Properties and Functions
(A)	(B)	(C)	(D)	(E)	(F)
Reticulum Cell (Mesenchymal cell).	Relatively resistant to irradiation HN_2 and to toxic stimuli of all varieties. Tendency to mat and to form colonies in vitro	*Stain Reactions*			Possess pseudopoidal migration. Form stromal support for hematopoietic tissues. Line sinuses of bone marrow, lymph nodes, and spleen[40]. Line sinusoids of liver, adrenal cortex, and possibly anterior lobe of pituitary gland. Associated with intermediate metabolism of blood and bile pigments, cholesterol, and iron[1]. Stem cells for myeloblasts, monoblasts, megakaryoblasts, lymphoblasts, pronormoblasts, promegaloblasts, and plasmablasts[2]. Form osteoblasts and possibly osteoclasts. May form cartilage cells (chondrocytes). Form osteocytes. Transform into adipose cells Form argyrophil (reticular) fibers Possess all functions ascribed to histiocyte.
				Cytoplasm proper: May have azure granules in smears. Granules: Hemosiderin granules Argyrophilic. Sudan black B.	
Plasmacyte (Plasma cell).	Relatively resistant to irradiation and HN_2.	*Chemical Contents*			Are not phagocytic[41]. May show marked peripheral cytoplasmic dissolution[28]. Participate in antibody formation after reinjection of antigen. Participate in antibody formation after simple injection of antigens[2]. Secrete glycoglobulins and mucoglobulins. May transform into plasma mast cells.
		Alkaline phosphatase. No peroxidase[1].		Cytoplasm proper: Acid phosphatase[41]. Ribonucleoprotein. Mucoprotein. Russell bodies: Peroxidase[1]. Mucoprotein Ribonucleic acid	
		Stain Reactions			
				Neutral red vacuoles may be arranged as rosettes about cytocentrum Stains red with Unna's stain. Pyronin of methy-green-pyronin positive. Acridine red of malachite-green-acridine-red positive Russell bodies stain pink with H & E.	

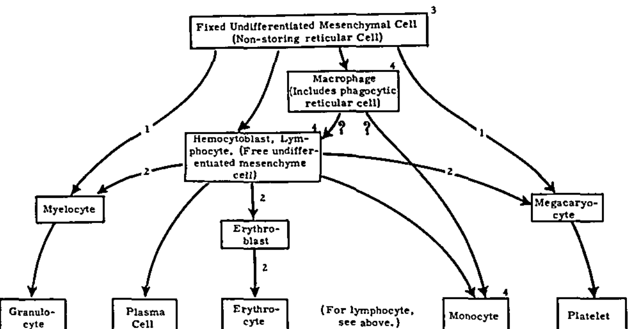
/1/Statement of a positive finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned. /28/May be first step in disintegration. /40/No longer serve as stem cells except pathologically. /41/Usually.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS[1] (Concluded)

Cell Type	Physical and Chemical Properties	Chemical Contents and Stain Reactions: Nucleus and Cytoplasm	Chemical Contents and Stain Reactions: Nucleus	Chemical Contents and Stain Reactions: Cytoplasm	Biological Properties and Functions
(A)	(B)	(C)	(D)	(E)	(F)
Myeloma Cell[42]		**Chemical Contents**			Exhibit *frequent cytoplasmic budding*[28]. May *form* Russell *bodies*. Cells often associated with abnormally increased plasma globulins. Cells often associated with abnormal plasma protein formation (Bence-Jones protein). Produce less globulin than mature plasma cells.
		Vitamin A. Free alpha amino acid groups.		Cytoplasm proper: Fine, granular, glycogen. Hof: Phospholipids[2]. Alkaline phosphatase *negative*.	
		Stain Reactions			
				Hof: Janus green B positive Sudan black B positive. Sudan IV positive. Nile blue sulphate positive. Smith-Dietrich positive.	

/1/Statement of a positive finding in this table does not necessarily imply a negative finding in the same respect elsewhere in the table. /2/Questioned. /28/May be first step in disintegration. /42/Usually considered to be a malignant form of plasmacytic series.

56. GENEALOGY OF THE FORMED ELEMENTS OF BLOOD
Monophyletic Theory, William Bloom, (1952)



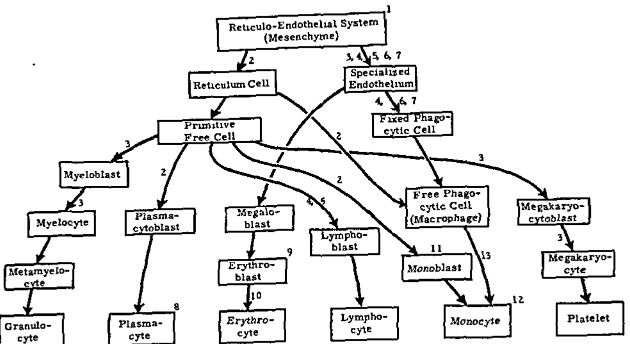
/1/ *In ectopic myelopoiesis.* /2/ *Normally in bone marrow, in lymphatic and other tissues in ectopic myelopoiesis.* /3/ *Also* gives rise directly to the fibroblast, fat cell, chondrocyte, osteoblast, and in the embryo, to the tissue mast cell and the endothelial cell. The fibroblast, chondrocyte, and osteoblast each may give rise to the osteocyte which in turn may give rise to the osteoclast, and this to the reticular cell. Whether fibroblasts can become non-storing reticular cells in mammals is not clear. /4/ Gives rise in tissue culture and inflammation to the macrophage, and this to the fibroblast.

57. GENEALOGY OF THE FORMED ELEMENTS OF BLOOD

Modified Neo-Unitarian (Monophyletic) Theory (of Downey), Oliver P. Jones, (1952)

/1/ Thick lines indicate the relation of blood cells in the normal human adult; thin lines indicate the various possibilities under pathological and experimental conditions. /2/ Megaloblast and normoblast each represent three consecutive forms, basophilic, polychromic and orthochromic. /3/ The large lymphocyte intervenes between the reticulo-lymphocyte and the (mature) lymphocyte. /4,5,6,7/ See bibliography.

58. GENEALOGY OF THE FORMED ELEMENTS OF BLOOD
Polyphyletic (Dualist) Theory, Charles A. Doan, (1952)



/1/ Also gives rise to the lipoblast which gives rise to the fat cell, both the former and the latter cells are found in special fat organs, diffuse connective tissue and bone marrow. /2/ In diffuse connective tissue and organ parenchyma. /3/ In bone marrow. /4/ In lymph nodes. /5/ In spleen. /6/ In Kupffer cells in liver. /7/ In *endothelium (or sinusoids)* of locations cited. /8/ Rare in blood, more common in connective tissue. /9/ Both early and late forms. /10/ Genealogical sequence from erythroblast is normoblast, reticulocyte and erythrocyte. /11/ May give rise to myeloblast in tissue culture. /12/ May give rise to fibroblast-like cell in tissue culture and may revert to monoblast on demand. Monocyte also may give rise to epithelioid cell in fatty degeneration (of tuberculosis caseation) and to the Langhans giant cell, and foreign body giant cell. /13/ On demand. There is evidence that macrophage may also give rise to fat cell or the reverse.

59. NOMENCLATURE RECOMMENDED[1] FOR CELLS OF BLOOD AND BLOOD-FORMING ORGANS

	General Cell Type (A)	Specific Cell Type: Term to be used (B)	Specific Cell Type: Terms to be avoided (C)
1		Rubriblast	Frythroblast, megaloblast, pronormoblast, promegaloblast, normoblast, hemocytoblast, normoblast, myeloblast, lymphoidocyte, stem cell, karyoblast
2	Erythrocytic Series	Prorubricyte	Erythroblast, megaloblast, pronormoblast, normoblast, macronormoblast, macroblast, prokaryocyte
3		Rubricyte	Normoblast, pronormoblast, macronormoblast, erythroblast, polychromatophilic normoblast, karyocyte
4		Metarubricyte	Normoblast, erythroblast, metakaryocyte
5		Reticulocyte[2]	
6		Erythrocyte	Red blood cell, erythroplastid, normocyte, akaryocyte
7		Lymphoblast	Myeloblast, hemocytoblast, lymphoidocyte, stem cell, lymphocyte
8	Lymphocytic Series	Prolymphocyte	Large lymphocyte, pathologic large lymphocyte, atypical leukocytoic lymphocyte, monocyte, immature lymphocyte
9		Lymphocyte	Small, medium, or large lymphocyte, normal lymphocyte, small, medium, or large mononuclear
10		Monoblast	Myeloblast, hemocytoblast, lymphoidocyte, lymphocyte, stem cell, immature monocyte
11	Monocytic Series	Promonocyte	Premonocyte, hemohistioblast, immature monocyte, Ferrata cell
12		Monocyte	Large mononuclear, transitional, plasmatocyte, endothelial leukocyte, histiocyte, resting wandering cell
13		Myeloblast	Granuloblast, hemocytoblast, lymphoidocyte, lymphocyte, stem cell
14		Progranulocyte	Promyelocyte II, leukoblast, myeloblast, premyelocyte, promyelocyte, progranulocyte A
15	Granulocytic Series	Myelocyte	Granulocyte, myelocyte B, non-filament, class I
16		Metamyelocyte	Metagranulocyte, juvenile, myelocyte C, non-filament, class I
17		Band Cell	Staff cell, stab cell, non-filament, class I, rod nuclear, polymorphonuclear, stabkernige, rhabdocyte, non-segmented
18		Segmented	Polymorphonuclear, filamented, class II, III, IV, or V, lobocyte
19		Plasmablast	Myeloblast, hemocytoblast, lymphoidocyte, lymphocyte, stem cell, lymphoblastic plasma cell, myeloma cell
20	Plasmacytic Series	Proplasmacyte	Türk cell, Türk irritation form, lymphoblastic or myeloblastic plasma cell, myeloma cell
21		Plasmacyte	Plasma cell, Unna's plasma cell, Marschalko's plasma cell, plasmacytoic lymphocyte, myeloma cell
22		Megakaryoblast	Megalokaryoblast
23	Thrombocytic Series	Promegakaryocyte	Premegalokaryocyte
24		Megakaryocyte	Megalokaryocyte
25		Thrombocyte	Platelet, thromboplastic
26	Not Identifiable	Disintegrated cell	Senile cell, smudge, basket cell, smear cell, degenerated cell

/1/ By the Committee for Clarification of the Nomenclature of Cells and Diseases of the Blood and Blood-forming Organs. This Committee is sponsored by the American Society of Clinical Pathologists and by the American Medical Association. /2/ It is recommended that the reticulocyte stage be considered a subdivision of the erythrocyte stage.

60. BONE MARROW (STERNAL) DIFFERENTIAL CELL COUNT: MAN

Author	Israels (1948)	Diggs (1948)	Whitby & Britton (1950)	Leitner (1945)	Lucia (1947)		Berman (1949)	Wintrobe (1947)		Vaughan (1947)		Osgood (1944)	
Amount aspirated (ml)		0 1-0 2	0 25	0 1-0 3	0 5		1 5	1.0-2 0		3 0		0 5-10 0	
Number of cases				♂920	♂96		♂919			♂42 ♀8		♂28 ♀24	
Cell count in per cent (%)	Range	Range	Range	Value	Value	Range	Value	Value	Range	Value	Range	Value[1]	Range
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)
[illegible] ...)	0 5-4	0-2	0-4	0 8[2]	0 6[3]	0-4	3[4,5]	4 0[4]	1-8			0 2[6]	0-1[b]
[illegible] ...es")	1-5	1-4[7]	4-15	3 2[2,8]	8 0[9]	0-24	10[5,10]	18.0[11]	7-32	9.5[11]	1.5-24	2 0[12]	0-4[b]
[illegible] ...blasts	12-20	2-5[13]		24 4[2,11]			86[5,14]					6.0[15]	4-8[b]
[illegible] ...tes")	6-10	7-20[11]	7-19		12 0[11]	0-29	1[5,16]					3.0[17]	1-5[b]
[illegible]	0 3-2	0-3	0-2 5	1 2	1.0	0-3 3	3[18]	2 0	0.3-5	1.3	0-3	0 4[19]	0-1[b]
[illegible]	1-8	1-5[20]	0 5-5[21]	2 2[21]	4 0[21]	0 4-7 6	9[21]	5 0[21]	1-8			1.4[21]	0-3[b]
[illegible]	5-20	2-8	2-8 0-1	12.6[22] 1 4 0 02	10 2 0.8	2-18 0.5-2	6	12 0 1.5[24] 0.3	5-19 0 5-3 0-0 5	8.9	2-16	4.2[23]	0-12[b]
[illegible]	13-32[27]	3-12[28]	10-25 0-2.5	10 2 0 8	13.2 1 3	6-20 0-2.3	9	22.0	13-32	8.8[25]	3.5-18	6.5[26]	3-10[b]
[illegible]		20-40		24	24 6	0 6-50	31			23 9	12-34	24.0[29]	17-33[b]
[illegible]	7-30 0 5-4[30] 0-1	9-30 0-3[30] 0-1	10-40[27,31] 0-4[27,31] 0-1[31]	28 4 1.8 0 02	10 0[31] 0 3[31]	0-26 0 5-1	17 2	20 0[31] 2 0[31,32] 0 2[31]	7-30 0 5-4 0-0 7	18 5[33] 1.9[33] 0 2[33]	6-36 0-6 5 0-1.5	15 0[34] 2 0[34] 0 2[34]	5-25[b] 0-4[b] 0-0 5[b]
[illegible]	3-20	5-15	5-20	7 6	10 3	0-22	24	10.0	3-17	16 2	7-35	14 0	3-25[b]
[illegible]	0 5-5	0-1	0-5	1 4	0 9		5	2.0	0 5-5	2 4	0-6	2 0	0-4[b]
[illegible]				0 8				0 4	0 03-3				
[illegible]	0-2	0-1[35]	0-1	1 2	1 5	0-5	1	0 4[35]	0-2	0 3[35]	0-1 5		
[illegible]				0 4[36]			2	0 2	0 2-2	0 3[37]	0-2 5		
[illegible] ...lls				3 5						0 02	0-0 5		
[illegible] ...ells										7.9	0-18	19 0	10-30[b]
[illegible] Cells				60,000- 100,000						35,300	9,400- 74,000	35,000	10,000- 100,000[b]

/1/ Smoothed weighted mean. /2/ Per 100 leukocytes /3/ Megaloblasts /4/ Pronormoblasts /5/ In per cent of red series. /6/ Karyoblasts. /7/ Early erythroblasts /8/ Macroblasts. /9/ Erythroblasts /10/ *Basophilic normoblasts* /11/ Normoblasts /12/ Prokaryocytes /13/ Late erythroblasts /14/ Polychromatic normoblasts /15/ Karyocytes /16/ Orthochromatic normoblasts /17/ Metakaryocytes /18/ Myeloblasts & leukoblasts /19/ *Granuloblasts* /20/ *Premyelocytes.* /21/ Promyelocytes. /22/ Neutrophil halbreife myelozyten & neutrophil reife myelozyten /23/ Includes early neutrophilic myelocytes (value=1.0, range=0 0-3 0). /24/ May include eosinophilic metamyelocytes /25/ Young forms /26/ Metagranulocytes *neutrophilic, eosinophilic,* & basophilic. /27/ Includes neutrophilic band cells. /28/ Juvenile neutrophils /29/ Rhabdocytes neutrophilic, eosinophilic, & basophilic. /30/ Includes eosinophilic myelocytes, metamyelocytes, band cells, and seg cells /31/ *Polymorphonuclear neutrophilic,* eosinophilic, & basophilic /32/ May include eosinophilic band cells /33/ Filament cells, neutrophilic, eosinophilic, & basophilic, may include all eosinophilic & basophilic cells. /34/ Lobocytes neutrophilic, eosinophilic, & basophilic. /35/ Plasma cells. /36/ Endothelien cells /37/ Reticulo-endothelial cells.

61. BONE MARROW (STERNAL)[1] DIFFERENTIAL CELL COUNT, SUMMARY: MAN[2]

	Cell Types (A)	(B)	(C)	Value[3,5] % (D)	Range[4,5] % (E)
1	Red Series 19.1%	Early 2.9%	Proerythroblasts	0.5	0.2 - 4.0
2			Early Normoblasts	2.4	1.5 - 5.8
3		Late 16.2%	Intermed. Normoblasts	11.7	5.0 -26.4
4			Late Normoblasts	4.5	1.6 -21.5
5	White Series & Others 70%	Granulocytic 57.4%	Myeloblasts	1.2	0.3 - 3.1
6			Progranulocytes	3.0	0.5 - 4.5
7			Myelocytes	8.7	0.9 -20.3
8			Metamyelocytes	11.0	5.6 -22
9			Band Cells	17.9	6.1 -36
10			Segmented Cells	15.6	8.7 -27
11		Others 12.6%	Lymphocytes	9.8	2.7 -24
12			Monocytes	1.4	0.7 - 2.8
13			Megakaryocytes	0.2	0.03- 0.4
14			Plasmacytes	0.6	0.1 - 1.5
15			Reticulum Cells	0.6	0.03- 1.6
16	Not Identifiable 10.9%		Unclassified Cells	1.7	0 02- 3.3
17			Disintegrated Cells	9.2	1.1 -20.8

/1/ Sternal aspirations of 0.1-10.0 ml of bone marrow. /2/ Men and women, 750 adults. /3/ Grand mean of 21 authors' means. /4/ Range of authors' means. /5/ These values are averages of results from different laboratories using different techniques. Values from any one laboratory may be expected to show a consistent departure from the averages.

62. BONE MARROW (STERNAL) DIFFERENTIAL CELL COUNT IN PREGNANCY[1]: MAN

	Cell Types	First Trimester				Second Trimester				Third Trimester	
		Cells per mm³		% of Total		Cells per mm³		% of Total		Cells per mm³	
		Value	Range	Value	Range	Value	Range	Value	Range	Value	Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1	Proerythroblasts ("Rubriblasts")	56	0- 136	0 2	0.0- 0 4	73	0- 203	0 2	0 0- 1 0	61	0- 210
2	Early Normoblasts ("Prorubricytes")	749	86- 1,314	2 1	0 6- 3.2	797	251- 1,875	2 0	1.0- 4 0	1,050	51- 3,937
3	Intermed Normoblasts ("Rubricytes")	1,139	259- 2,628	3 2	1 6- 5 0	1,803	314- 7,000	4 0	2 0- 6 4	1,865	51- 8,636
4	Late Normoblasts ("Metarubricytes")	944	28- 2,700	2 2	0 2- 6 0	835	250- 2,000	2 2	0 4- 7 0	836	119- 2,730
5	Myeloblasts	63	0- 328	0 1	0 0- 0 5	173	0- 1,250	0 3	0 0- 1 0	96	0- 635
6	Progranulocytes	378	38- 900	1 0	0 2- 2 1	462	69- 2,500	0 9	0 4- 2 0	541	0- 1,460
7	Early Neutrophilic Myelocytes	262	0- 675	0 7	0 0- 1 5	446	0- 3,500	0 7	0 0- 2.8	362	51- 1,050
8	Myelocytes Eosinophilic[2]	218	28- 494	0 7	0 2- 2 6	251	0- 1,400	0 4	0 0- 1 6	167	0- 700
9	Myelocytes, Neutrophilic	2 267	172- 4,336	6 0	1 2-10 6	3,229	659- 13,125	7 0	4 0-11 2	2,138	391- 7,937
10	Metamyelocytes Neutrophilic	2 165	259- 5,913	5 7	1 8- 9 0	2,623	251- 10,250	5 4	1 6- 8 6	1,879	340- 4,900
11	Band Neutrophils	11 659	2 189-28,251	30 2	15-46	15,415	3,077- 46,250	34 0	19.6-48	11,819	4,901-29,400
12	Segmented Neutrophils	5,445	4 050- 8,835	18 6	9 0-38	5,441	1,575- 11,750	15 3	8 0-21 6	4,613	394- 8,680
13	Segmented Eosinophils[3]	371	48- 1,140	1 3	0.2- 6.0	299	18- 990	0 8	0 1- 1 8	228	0- 700
14	Segmented Basophils	78	0- 197	0 3	0 0- 1 0	47	0- 125	0.1	0 0- 0.6	49	0- 192
15	Lymphocytes	3 975	2,894- 6,300	13 5	4 5-28	4,467	1,686- 10 000	12.9	5 6-25	3,719	1,318- 5,400
16	Monocytes	333	40- 965	1 1	0 1- 3 0	245	0- 642	0 7	0 0- 1 8	194	0- 332
17	Disintegrated Cells	4,684	1 382- 8 100	13 3	9 6-18 0	4,675	1,037- 11,500	12 4	6 0-23 5	4,480	1,329-11,900
18	Total Nucleated Cells	34 580	14,400-65 700			42,510	15,700-125,000			33,930	16,900-70,000

	Cell Types	Third Trimester (Continued)		First, Second, Third Trimesters				Non-Pregnant Females			
		% of Total		Cells per mm³		% of Total		Cells per mm³		% of Total	
		Value	Range	Value	Range	Value	Range	Value	Range	Value	Range
	(A)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)	(S)	(T)	(U)
1	Proerythroblasts ("Rubriblasts")	0 2	0 0- 0 5	64	0- 210	0 2	0 0- 1 0	28	0- 122	0 1	0 0- 0 4
2	Early Normoblasts ("Prorubricytes")	2 8	0 3- 6 2	886	51- 3,937	2.4	0 3- 6 2	616	62- 1,396	2 5	0.6- 4 0
3	Intermed Normoblasts ("Rubricytes")	5.3	0 3-13 6	1,662	51- 8,636	4 3	0 3-13 6	1,199	134- 2,904	5 0	1 3- 8 0
4	Late Normoblasts ("Metarubricytes")	2 4	0 6- 6 5	863	28- 2,730	2 3	0 2- 7 0	453	43- 1,089	1 9	0 4- 3 2
5	Myeloblasts	0 2	0 0- 1 0	115	0- 1,250	0 2	0 0- 1 0	89	0- 279	0 3	0 0- 0 8
6	Progranulocytes	0 9	0 0- 2 3	393	0- 2,500	0 9	0 0- 2 3	251	11- 736	1.0	0.1- 2 2
7	Early Neutrophilic Myelocytes	1 0	0 3- 2 5	366	0- 3,500	0.8	0 0- 2 8	147	0- 630	0 5	0 0- 1 4
8	Myelocytes, Eosinophilic[2]	0 4	0 0- 1 0	209	0- 1,400	0 5	0 0- 2.6	147	0- 544	0 5	0.0- 1 5
9	Myelocytes, Neutrophilic	5 7	2 3-12 5	2,552	172- 13,125	6 3	1 2-12 5	1,568	168- 4,140	6 0	1 4-11.0
10	Metamyelocytes, Neutrophilic	5.3	2 0- 9 0	2,211	251- 10,250	5 5	1 6- 9 0	1,437	168- 4,324	5 6	1 4- 9 4
11	Band Neutrophils	34 5	23 5-45	10,415	2,189- 46,250	33 3	15 2-48	6,048	1,091-14,490	23 7	12 4-34
12	Segmented Neutrophils	14 3	1 6-25	5,111	394- 11,750	15 7	1.6-38	3,565	1,132- 7,084	16 6	10.4-33
13	Segmented Eosinophils[3]	0 7	0 0- 1 6	288	0- 1,140	0 9	0.0- 6 0	246	60- 642	1 3	0 2- 6 0
14	Segmented Basophils	0 2	0 0- 0 6	56	0- 197	0.2	0 0- 1 0	53	0- 184	0.3	0 0- 0 8
15	Lymphocytes	12 0	5 5-23 3	4,045	1,318- 10,000	12 7	4.5-28	3,428	1,721- 6,520	16 8	9.2-30
16	Monocytes	0 7	0 0- 2 4	246	0- 965	0 8	0 0- 3 0	312	32- 717	1 4	0 0- 3 5
17	Disintegrated Cells	13 2	5 5-23 6	4,599	1,037- 11,900	12.9	5 5-23 6	3,578	1,081- 6,534	16 2	10 5-24.0
18	Total Nucleated Cells			36,760	14,000-125,000			25,100	7,500-46,000		

/1/ 40 pregnant females and 28 non-pregnant females, 10 ml marrow aspirated Proplasmacytes, plasmacytes, basophilic myelocytes, early myelocytes (eosinophilic and basophilic), not tabulated but present in numbers less than 0 1%. /2/ Includes eosinophilic metamyelocytes. /3/ Includes band eosinophils.

63. BONE MARROW (RIB) DIFFERENTIAL CELL COUNT: DOG

	Author	Stasney & Higgins (1937)		Van Loon (1943)		Mulligan (1941)		Rekers & Coulter (1948)		Mulligan (1945)	
	Age	Adult		Adult		Adult		19-24 mos.		0.5-2.5 days	
	Number of cases	35		81		35		36		21	
	Cell count in per cent (%)	Value	Range	Value	Range	Value	Range	Value	Range	Value	Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1	Myeloblasts	2.4[1]	0-5.1[b]	0.6	0.2-1[c]	0.6	0-1.8[c]	1.9	0.2-3.7[c]		0-2.2[c]
2	Early Myelocytes	2.8[2]	0-5.8[b]	1.6[2]	0.7-2.8[c]	1.5[2]	0.2-4.6[c]	0.7	0-3.3[c]	0.8[2]	
3	Myelocytes, all			6.0	2.7-10[c]	4.7	2.2-11[c]	2.7	0-9.5[c]	4.3	2.0-6.6[c]
4	Neutrophilic	8.9	2.8-15[b]								
5	Eosinophilic	1.2	0-2.4[b]								
6	Metamyelocytes	15.3	7.2-23[b]	3.4	1.1-4.6[c]	10.5	5.6-20[c]	5.1	0-24[c]	9.7	7-12[c]
7	Band Cells			11.7	6.8-17[c]	31.0	17-54[c]	42.4	17-63[c]	20.6	15-28[c]
	Segmented Cells										
8	Neutrophilic	5.1	0-12.5[b]	30.1	17-44[c]	3.9	0.2-8.5[c]	5	0.2-14[c]	3.4	0.8-6.6[c]
9	Eosinophilic	2.8	0-6.8[b]	2.0	0.4-3.8[c]	3.7[3]	1-6.8[c]	4.7[3]	0.2-19[c]	2.4[3]	0-5.2[c]
10	Basophilic	0.1	0-0.3[b]					0.2	0-1.3[c]		
11	Lymphocytes	1.2	0.2-2.3[b]	0.9	0.2-2.7[c]	1.9	0-6.6[c]	0.7	0-8[c]	3.3	1.6-6[c]
12	Monocytes	0 1	0-0.5[b]	0.2	0-0.3[c]						
13	Megakaryocytes			0.5	0-1.4[c]			0.6	0-1.1[c]		
14	Proerythroblasts ("Rubriblasts")	59	40-78[b]	0.6[4]	0.2-2.7[c]	0.5[4]	0-1.4[c]	0.35[5]	0-1.3[c]	1.3[4]	0.4-3.2[c]
15	Early Normoblasts ("Prorubricytes")			7.8[6]	6.4-10[c]	1.5[6]	0.4-3.8[c]	28.2[7]	8-54[c]	5.8[6]	3-9.5[c]
16	Intermed. Normoblasts ("Rubricytes")			16.4[8]	11-26[c]	38.1[8,9]	19-64[c]			45.1[8,9]	33-57[c]
17	Late Normoblasts ("Metarubricytes")			17.4[9]	9-26[c]			4.6[10]	0-11[c]		
18	Plasmacytes	1.	0-2.1[b]					0.4	0-2.1[c]		
19	Reticulum Cells	0.2[11]	0-0.7[b]								
20	Unclassified Cells					2.1	0.8-6.1[c]	3	0-16[c]	3.1	0.8-5.4[c]
21	Total Nucleated Cells (millions/mm3)							1.2[12]	0.8-1.8[13]		

/1/ Includes "Leukoblasts." /2/ Promyelocytes. /3/ Eosinophilic cells, all forms. /4/ Pronormoblasts. /5/ Megaloblasts. /6/ Basophilic normoblasts. /7/ Erythroblasts. /8/ Polychromic normoblasts. /9/ Orthochromic normoblasts. /10/ Normoblasts. /11/ Includes "Heterophils." /12/ Mean of the means. /13/ Range of the means.

64. BONE MARROW (RIB)[1] DIFFERENTIAL CELL COUNT, SUMMARY: DOG[2]

	Cell Types (A)		(B)	(C)	Value[4,6] % (D)	Range[5,6] % (E)
1	Red Series	43.6%	Early 5.4%	Proerythroblasts	0.5	0.3 - 0.6
2				Early Normoblasts	4.9	1.5 - 7.8
3			Late 38.2%	Intermed. Normoblasts	22.3	11.0 -26.
4				Late Normoblasts	15.9	4.6 -17.4
5	White Series and Others	54.9%	Granulocytic 52.2%	Myeloblasts	1.2	0.6 - 2.4
6				Early Myelocytes, Neutrophil.	1.4	0.7 - 2.8
7				Myelocytes, Neutrophilic	4.8	2.7 - 8.9
8				Metamyelocytes, Neutrophilic	7.4	3.4 -15.3
9				Band Cells, Neutrophilic	24.6	11.7 -42
10				Segmented Cells, Neutrophil.[3]	9.6	3.9 -30
11				Eosinophilic Cells, all types	3.1	2.0 - 4.7
12			Others 2.7%	Lymphocytes	0.9	0.7 - 1.9
13				Monocytes	0.2	0.0 - 0.2
14				Megakaryocytes	0.4	0.1 - 0.6
15				Plasmacytes	0.3	0.0 - 0.4
16				Reticulum Cells	0.9	0.0 - 1.0
17, 18	Not Identifiable 1.5%			Unclassified Cells	1.5	0.0 - 3.0

/1/ Rib extrusions. /2/ 187 adult dogs. /3/ Includes basophilic cells (0.05-0.2 range of means). /4/ Grand mean of 4 authors' means. /5/ Range of 4 authors' means. /6/ These values are averages of results from different laboratories using different techniques. Values from any one laboratory may be expected to show a consistent departure from the averages.

65. MORPHOLOGY OF FORMED ELEMENTS OF BONE MARROW: MAN[1]

	Cell Type	Size µ	CYTOPLASM: Granules	CYTOPLASM: Relative Amount	CYTOPLASM: Color
	(A)	(B)	(C)	(D)	(E)
1	Reticulum cell (Reticulo-endothelial cell, Stem cell of modern pathologists, Mesenchymal cell, Hemohistioblast)	15-25	[illegible]	[illegible]	Pale to dark blue; may be mottled with abundant, colorless, or slightly acidophilic hyaloplasm.
2	*Myeloblast*[2] (*Hemocytoblast*, Stem cell of classic hematologists)	10-18	May or may not contain fine, angular, purple, *azurophil* granules	*Usually* a narrow band	Pale to dark blue.
3	Progranulocyte[3] (Leukoblast, "Myeloblast" of Italian authors)	14-21 mean =17	May or may not contain fine, angular, purple, azurophil granules; are less commonly round and larger; may be numerous; may overlie nucleus.	Usually moderate; more than *myeloblast*.[4]	Varying shades of blue but usually pale blue or mottled.
4	(*Early*) Myelocyte[5] (*Promyelocyte*)	12-18	May or may not contain azurophil granules At *this stage* the first *few* specific granules are *seen*.[6]	Usually moderate to abundant.	Varying shades of blue, usually pale; paler areas in region of cytocentrum, darker at periphery.
	(*a*) Neutrophilic		(a) Pink specific granules first appear about cytocentrum; may show diffuse *pink* masses of neutrophilic substances.		
	(*b*) Eosinophilic		(b) Round, *red, large* specific granules; a few early ones *are blue to* purple.		
	(*c*) Basophilic		(*c*) Few very large, metachromatic, specific granules; *vary in* size; water *soluble*.		
5	(Late) Myelocyte (a) Neutrophilic	10-16	(*a*) *Specific* granules *are* pink and more numerous than in *early* myelocyte	Moderate to abundant.[7]	(a) Usually clear or colorless
	(b) Eosinophilic		(*b*) Specific granules are red and more numerous than in early *myelocyte*		(*b*) May be pale blue.
	(c) Basophilic		(c) Specific granules are metachromatic and more numerous than in early myelocyte		(*c*) May be pale blue.

/1/ Table applies only to elements as observed in *ordinary air-dried* smears *after* Romanowsky stains. For characteristics of the corresponding *elements* as *observed* in tissue sections and moist smears, *refer* to Chapter 5, Maximow, A., and Bloom, W., "A Textbook of Histology," W. B. Saunders, Philadelphia, 1948. For characteristics of the corresponding *elements* as observed with the supravital technique, refer to Tompkins, E. H., and Cunningham, R. S., *in Sections* IX and X in Vol. I of "Handbook of Hematology," Hal Downey, Edi-

65. BONE MARROW MORPHOLOGY[1] (Continued)

NUCLEUS					
Shape	Position	Nuclear Membrane	Nucleoli	Chromatin Pattern	Parachromatin Pattern and Amount
(F)	(G)	(H)	(I)	(J)	(K)
Round, oval, reniform, or rarely indented	Central or eccentric	Moderately thin.	0-6; usually 3-6; round irregular … ance.	Irregular network of light, red-violet … unequal in size.	Small amount; pink or pale blue; fills irregular chinks in chromatin interstices; abundant and distinct from chromatin
Round or oval	Usually central	Very thin and indistinct	0-5, pale blue, round or oval, occasionally irregular, chromatin may delimit nucleoli	Fine network of chromatin strands with regular, equal, small interstices; chromatin strands are thin, or the pattern may appear as one of fine regular stipples, no clumping; stains a light lavender.	Small amount; fine pink or pale blue parachromatin in small interstices of chromatin; distinct from chromatin.
Round or oval	Central or eccentric.	Thin	… periphery	… chromatin, especially about nucleoli	
Round or oval	Central or eccentric	Thin	Occasionally present, usually not visible; when present, pale blue and round or oval	Network of chromatin filaments, slightly coarsened with less regular interstices	Small amount; pale blue or pink; distinct from chromatin
Round or oval	Central or eccentric	Distinct, thick	None visible	Thickened chromatin strands form a coarse meshwork, staining a deep purple	Small amount; pale blue or pink; distinct from chromatin

tor, Paul B Hoeber, New York, 1938 /2/ Nomenclature recommended by Committee for Clarification of the Nomenclature of Cells and Diseases of the Blood and Blood-forming Organs (Blood 4:89, 1949) /3/ Vacuoles are common in cytoplasm, may have clear ectoplasm /4/ Abundant hyaloplasm /5/ All characterized by specific granules and basophilic spongioplasm /6/ All characterized by increase in colorless hyaloplasm and in specific granules

65. BONE MARROW MORPHOLOGY[1] (Continued)

	Cell Type	Size μ	CYTOPLASM: Granules	CYTOPLASM: Relative Amount	CYTOPLASM: Color
	(A)	(B)	(C)	(D)	(E)
6	Metamyelocyte[2] (Juvenile) (a) Neutrophilic	10-16	(a) Specific granules are pink to rose-violet and more numerous than in late myelocyte.	Abundant	Colorless or slightly acidophilic.
	(b) Eosinophilic		(b) Specific granules are red and more numerous than in late myelocyte.		
	(c) Basophilic		(c) Specific granules are metachromatic and more numerous than in late myeloctye.		
7	Granulocyte, neutrophilic, band (Regenerative).	(See Table on Morphology of Blood Leukocytes and Platelets: Man)			
8	Granulocytes, segmented: Neutrophilic Eosinophilic Basophilic.				
9	Lymphoblast[2]	10-18	Azurophil granules are usually absent	*Usually forms narrow* band; may have large cell body[?]	Varying shades of pale to dark blue.
10	Prolymphocyte[2] (Immature lymphocyte).	10-18	Azurophil granules may or may not be present; usually absent.	Usually forms very narrow band, may have large cell body	Varying shades of pale to dark blue.
11	Lymphocyte Small Medium	*(See Table on Morphology of Blood Leukocytes and Platelets: Man)*			
12	Leukocytoid Lymphocyte (Pathological lymphocyte, e.g., as in infectious mononucleosis)	10-16	May or may not contain round, purple azurophil granules Granules, if present, may be small or large, sparse or numerous		May have increased

/1/ Table applies only to elements as observed in ordinary air-dried smears after Romanowsky stains
/2/ Nomenclature recommended by Committee for Clarification of the Nomenclature of Cells and Diseases of

65. BONE MARROW MORPHOLOGY[1] (Continued)

NUCLEUS					
Shape	Position	Nuclear Membrane	Nucleoli	Chromatin Pattern	Pattern and Amount Parachromatin
(F)	(G)	(H)	(I)	(J)	(K)
Reniform, moderately indented	Central or eccentric	Thick, heavy	None visible	Thickened chromatin strands form a coarse meshwork, staining a deep purple	Small amount; pale blue or pink, distinct from chromatin in the interstices of the latter
Round or oval	Usually central	Thin	0-5, usually 1-2; pale blue, small, round, chromatin does not mass about nucleoli	Fine network of chromatin strands with regular, small interstices Chromatin strands are thin, or ... reticular filaments	Small amount; fine pink or pale blue, in small interstices of chromatin; dis- ...
Round, oval, or reniform, slightly indented	Central or eccentric	Thin to thick	Occasional blue, round, unmasked nucleolus	In some areas, fine to coarse network of chromatin strands, such areas blend imperceptibly with areas with indistinct, coarse, clumped chromatin masses	Small amount, pale blue, in some areas still distinct; in other areas blends with chromatin.
Round, oval, deeply indented, reniform, or irregular	Usually eccentric	Thick		Pattern may be lymphocyte-like (11J) if accompanied by extensive cytoplasmic changes, or pattern may be plasmacytic, ...	Varying amounts of ...

the Blood and Blood-forming Organs (Blood 4 89, 1949) /7/ Cytoplasm is homogeneous /8/ Downey recognized three cell types on the basis of these characteristics

65. BONE MARROW MORPHOLOGY[1] (Continued)

	Cell Type	Size µ	CYTOPLASM: Granules	CYTOPLASM: Relative Amount	CYTOPLASM: Color
	(A)	(B)	(C)	(D)	(E)
13	Monoblast[3,9]	14-18	May or may not contain fine azurophil granules.	Moderate or abundant.	Slightly basophilic or gray.
14	Monocyte[3] (Transitional or Blood mononuclear)	(See Table on Morphology of Blood Leukocytes and Platelets: Man)			
15	Megakaryoblast[3]	circa 15-50	Usually absent. A few coarse granules may be present.	As cell matures to promegakaryocyte, amount varies from narrow band to abundant.	Varying shades of blue. Usually zoned in lighter and darker areas.[10]
16	Promegakaryocyte[3,11]	circa 18-50	Azurophil granules begin to make their appearance near cytocentrum and spread through cell body.	Usually abundant.	Basophilic, but becomes paler blue as maturation approaches.
17	Megakaryocyte[3]	circa 30-70	Azurophil granules [illegible]	Large amounts. Pseudopodial processes fre- [illegible] of cytoplasm.	Pale blue. May begin [illegible]
18	Thrombocyte (Platelet)	(See Table on Morphology of Blood Leukocytes and Platelets: Man)			
19	Pronormoblast[12] or *Proerythroblast.* (Megaloblast of Supravitalists, Rubriblast)[4]	10-15	Usually absent.	Usually narrow band; ordinarily not quite as much as myeloblast, *but both vary; almost* always less than promegaloblast (24D).	Basophilic; stains deeply blue and is usually more homogeneous and condensed *than that of myelo*blast or promegaloblast; may have clear perinuclear zone.
	[illegible]	[illegible]	[illegible]	Because of shrinking of [illegible]	Basophilic; stains [illegible]

65. BONE MARROW MORPHOLOGY[1] (Continued)

NUCLEUS					
Shape	Position	Nuclear Membrane	Nucleoli	Chromatin Pattern	Parachromatin Pattern and Amount
(F)	(G)	(H)	(I)	(J)	(K)
Round, oval, may be indented	Ce ec				
Round, oval, reniform or indented Rarely multinucleated.	Central or eccentric.	Thin	0-10, pale blue, well circumscribed.	more darkly than myeloblast pattern	work.
Irregular or polylobular " Rarely multinucleated	Usually eccentric	Thin	Usually less numerous than megakaryoblast, (15I) but may still be very numerous	Stains more heavily than megakaryoblast; a regular distinct network remains but chromatin threads are coarser than in megakaryoblast and may show areas of clumping.	Small amount of pink between chromatin strands where they are not clumped
Markedly multilobular and complicated in form, less frequently round, oval, or multinuclear.	Central or eccentric	Thick, heavy	None visible	visible	chromatin may be seen
Round or oval	Central or eccentric	Very thin	Present but faint; appear to be dissolved out; give blue tint.	Similar to that of myeloblast (2J) but chromatin strands forming network are slightly thicker and there is some clumping, thus appearing more heavily stained, interstices are distinct but slightly irregular.	Small amount, less than myeloblast and much less than promegaloblast, stains pink and is distinct from chromatin
Round and smaller than pronormoblast	Central or eccentric	Thin	May still be present though usually none visible	Network now com-	Small amount; ar-

usually identified by "the company it keeps" /10/ Light area of hyaloplasm around nucleus /11/ Large cells of this group are called Intermediate Megakaryocytes /12/ Nucleus larger than megakaryocyte. /13/ There is a gradual decrease in nuclear size due to condensation as all the following cells in this series differentiate

65. BONE MARROW MORPHOLOGY[1] (Continued)

			CYTOPLASM		
	Cell Type	Size μ	Granules	Relative Amount	Color
	(A)	(B)	(C)	(D)	(E)
21	Polychromatophilic *Normoblast*[14] or Polychromatophilic Erythroblast (Late Rubricyte)[3]	circa 8-12	Absent	Because of shrinking [illegible]	Hemoglobin first ap- [illegible]
22	Orthochromatic or *Acidophilic Normo*-blast. (Metarubricyte)[3]	circa 7-10	Absent	Because of condensed nucleus, cytoplasmic to *nuclear ratio* is increased but is less than that of orthochromatic megaloblast.	Red, homogenous, and *smooth* because of hemoglobin predominance.
23	Erythrocyte[4 16]	7.2-7.8 mean =7.5	Absent	Non-nucleated corpuscle formed by loss of nucleus from the orthochromatic normoblast.	Orange-red hemoglobin; center is slightly paler than periphery.
24	Promegaloblast[14] (Rubriblast, Pernicious Anemia type)	13-25	Usually absent	[illegible]	[illegible]
25	Basophilic Megaloblast (*Prorubricyte, P.A.* type and Rubricyte, P.A. type)[3]	13-20	Absent	[illegible]	[illegible]
26	Polychromatophilic Megaloblast (Rubricyte, late, P.A. type)[3]	Usually 10-18 (May be much larger).	Absent	[illegible]	Varying amounts of eosinophilic (red) [illegible]
27	Orthochromatic Megaloblast[14] (*Late Rubricyte*, P.A. type and Metarubricyte, P.A. type)[3]	Usually 8-15 (May be much larger)	Absent	[illegible]	[illegible]

[illegible]

65. BONE MARROW MORPHOLOGY[1] (Continued)

NUCLEUS					
Shape	Position	*Nuclear* Membrane	Nucleoli	Chromatin Pattern	*Parachromatin* Pattern and Amount
(F)	(G)	(H)	(I)	(J)	(K)
Round but smaller than basophilic normoblast	*Central or* eccentric	Thick	None visible.	*Chromatin strands so* coarse that in many places they are condensed into masses; they may be arranged as wheel-spokes ("radkern")	Small amount; arranged as pink, irregular chinks in interstices of chromatin
Round but smaller than polychromatophilic normoblast.	Central or eccentric	Thick, coarse, heavy	None visible	Nucleus is condensed, no longer is any pattern visible	May either be absent or one or two pink chinks may still remain
Round or oval	Central or eccentric.	Very thin, indistinct		Delicate structure, al- [illegible]	More abundant than *in myeloblast* and much more than in pronormoblast. Appears as pink, comma-shaped areas distinct from chromatin.
Round and about same size as promegaloblast	Central or eccentric	Thin	Nucleoli often absent but they are more often present than in corresponding basophilic *normoblast.*	[illegible]	
Round	May be central but usually eccentric	Thin to thick.	*May still* be present, usually none visible.	*Pattern remains* the same as in the basophilic megaloblast; i e , there is a slightly coarsened network with prominent interstices. Reticular struc*ture still evident.*	Remains abundant, pink; fills interstices in chromatin network from which it is distinct.
Roun[illegible]	Usually eccentric,	Thick	May still be present; usually	Pattern shows all *gradations from* a slightly coarsened network with numerous distinct interstices to	Parachromatin is pink; varies from abundant, when chromatin interstices are large to

tingu[illegible]
decre[illegible]
as the[illegible]

65. BONE MARROW MORPHOLOGY[1] (Continued)

	Cell Type	Size μ	CYTOPLASM Granules	Relative Amount	Color
	(A)	(B)	(C)	(D)	(E)
28	Megalocyte[18]	Greater than 7.8	Absent	Non-nucleated corpuscle formed from the cytoplasm of the orthochromatic megaloblast, often pear-shaped.	Orange-red hemoglobin; *homogeneous or slightly dark red* through thicker center.
29	Plasmablast[8,19,20] (Reticular plasma cell).	25-40	Usually absent. (Azu*rophil granules are* rarely described in abnormal forms).	*Large amounts.*	Varying shades of blue, usually light blue or moderately deep; basophilic spongioplasm is mottled with *bars of hyaloplasm (mitochondria)*; caniculated appearance; Hof is indistinct; may show peripheral cytoplasmic dissolution.
30	Proplasmacyte[8,20]	circa 15-30	Usually absent.	Abundant, but less than plasmablast.	With shrinkage of cytoplasm, basophilia become more prominent. An eccentric, clear, perinuclear area, or Hof, develops; may show peripheral cytoplasmic dissolution.
31	Plasmacyte[8] (Marschalko plasma cell).	8-25	Usually absent.	[illegible]	Deep blue cytoplasm with large pale stain- [illegible] vacuoles[20]
32	Tissue Mast Cell[20]	8-25	Entire cytoplasm is stuffed or packed with metachromatic granules[21] which are spherical and uniform in size. May be so abundant as to mask nucleus; granules more water soluble than those of blood basophils	Abundant; cytoplasmic to nuclear ratio favors the cytoplasm.	Colorless

[illegible] staining [illegible]

65. BONE MARROW MORPHOLOGY[1] (Concluded)

NUCLEUS					
Shape	Position	Nuclear Membrane	Nucleoli	Chromatin Pattern	Parachromatin Pattern and Amount
(F)	(G)	(H)	(I)	(J)	(K)
Round or oval	Eccentric.	Thin	0 to 6, blue.	Irregular network of fine chromatin strands with irregular interstices. Resembles pattern of reticulum cell nucleus (1J) but has thicker strands and may show some clumping of chromatin.	Pink or yellow; distinct from chromatin strands; fills interstices of chromatin.
Round or oval and smaller than that of plasmablast.	Eccentric	Thin to thick.	1 or 2 nucleoli may still be present	Contraction of nucleus leads to further coarsening and thickening of reticular network; irregular interstices are still distinct.	Small amount; distinct in interstices of chromatin although interstices are irregular.
Round or oval; may be binucleate or multinucleate Usually smaller than nucleus of proplasmacyte (30F).	Eccentric.	Thick	None visible.	Chromatin further condensed; tends to pyknosis Coarse chromatin masses arranged [illegible] often in smears or imprints.	Small amount; dis- [illegible]
Small, round, or oval; may be binucleate.	Eccentric.	Varies in thickness.	None visible	Coarse chromatin masses arranged irregularly in clumps, or almost homogeneously	Small amount.

pute, the lymphocyte at times is considered to function as the plasmacyte precursor /20/ Cell outline may be spherical, ellipsoidal, or irregular. /21/ Metachromatic material is believed by some to be in the cytoplasm between the granules (Jaques).

66. HISTOCHEMICAL PROPERTIES OF BLOOD AND BONE MARROW CELLS: MAN

Cytoplasm proper (C); Specific Granules (G); Juxtanuclear bodies (J); Mitochondria (M); Nucleoli (N)

	Cell Type	Lipid[1]	Phospholipid[2]	Acid Phosphatase[3]	Alkaline Phosphatase[3]	Ribonucleoprotein[4]	Carbohydrate[5]	Peroxidase[6]
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
1	Nuclei (all types)	Neg	Neg	Pos	Pos[7]	Pos N	Neg	---
	Cytoplasm of:							
2	Myeloblasts	Pos M	Pos M	Neg	---	Pos C[8]	Neg	Neg
3	Progranulocytes	Pos GM	Pos G[7]M	Pos G	Neg	Pos C[8]	Neg	Pos G
4	Myelocytes	Pos GM	Pos G[7]M	Pos GC	Neg[9]	Neg	Pos[7,10]	Pos G
5	Metamyelocytes	Pos G	Pos G[7]	Pos G	Pos C[8,10]	Neg	Pos[7,10]	Pos
6	Segmented neutrophils	Pos G	Pos G[7]	Pos G	Pos C[8,10]	Neg	Pos[7,10]	Pos
7	Segmented eosinophils	Pos G	Pos G	Pos G	Neg	Neg	Pos G	Pos
8	Segmented basophils	Pos G	Pos G[7]	---	---	---	Pos G[10]	Neg
9	Tissue eosinophils	Pos G	Pos GM	Neg	Neg	Neg	Pos[7]	Pos
10	Lymphoblasts	Pos M	Pos M	---	---	Pos C[8]	---	Neg
11	Lymphocytes	Neg	Neg	Pos JG	Neg[12]	Pos C[8]	Neg[13]	Neg
12	Monocytes	Pos GM	Pos G	---	---	---	Pos C	Pos[11]
13	Megakaryocytes	Pos GM	Pos G[7]M	Pos[8]	Pos C[8]	Pos C[8,9]	Pos[10]	---
14	Thrombocytes	Neg	Pos C[8]G	---	---	Neg	Pos[10]	---
15	Proerythroblasts ("Rubriblasts")	Pos M	Pos M	Pos J	Neg	Pos C[8]	Neg	Neg
16	Early normoblasts ("Prorubricytes")	Pos M	Pos M	Pos J	Neg	Pos C[8]	Neg	Neg
17	Intermediate normoblasts ("Rubricytes")	Pos M	Pos M	---	Neg	Pos C[8]	Neg	Neg
18	Late normoblasts ("Metarubricytes")	Neg	Neg	---	Neg	Pos C[8]	Neg	Neg
19	Erythrocytes	Neg	Neg[8]	Neg[14]	Neg	Neg	Neg	Pos
20	Plasmacytes	---	---	Pos JG	Pos C[8]	Pos C	Pos[7]	Neg
21	Reticulum Cells	Pos G	Pos G[6]	Pos G	---	Neg	Pos G[15]	Neg
22	Mast Cells	Pos G[16]	Pos G	Pos G	Pos G	Neg	Pos G[17]	Pos

/1/ Stained with Sudan black B unless specified otherwise. /2/ Detected by acid-hematein method; negatively evaluated by pyridine extraction method. /3/ Detected by modified Gomori method using glycerophosphate substrate. /4/ Detected by Feulgen reaction; negatively evaluated by digestion with ribonuclease. /5/ Detected by either Periodic Acid-Schiff, or by Gomori silver-methenamine methods. /6/ Detected by benzidine-peroxide. /7/ Controversial. /8/ Diffuse staining. /9/ May be positive (Rabinovitch and Andreucci). /10/ As glycogen. /11/ Trace. /12/ May be positive. /13/ Positive according to Stowell, Wachstein. /14/ Positive when substrate is A.T.P. /15/ Probably is phagocytosed material (Lillie). /16/ Detected by staining with Sudan IV. /17/ Granules positive in many cells, negative in others.

67. BLOOD WATER AND SOLIDS

Blood (B), RBC (C), Plasma (P), Serum (S)

	Animal		Water g/100 ml[1]		Solids g/100 ml	
			Value	Range	Value	Range
	(A)		(B)	(C)	(D)	(E)
1	Man	B	83	81-86	23	20-25
2		C	72[2]	70-75[2]	37	34-39
3		P	94[2]	93-95[2]	8.6	7.9-9.1
4		S	93[3]	93-94[c]		
5	Cat	B	84[4]		21[4]	
6		C	62[3]		38[3]	
7		S	93[3]		7[3]	
8	Chicken	B	(87)[4,5]	(86-89)[4,5]		
9		C	72[4]	72-74[4]		
10		P	94[4]	92-95[4]		
11	Cow	B	85[4]		20[4]	
12		C	64[4]		44[4]	
13		S	91[3]		9[3]	
14	Dog	B	84	83-85	22	20-24
15		C	72	64-80[b]		
16		P	93	91-95		
17		S	92[3]		7.6[3]	
18	Goat	B	84[4]		20.5[4]	
19		C	61[3]		39[3]	
20		S	91[3]		9[3]	
21	Horse	B	81[4]		24[4]	
22		C	61[3]		39[3]	
23		S	91[3]		9[3]	
24	Pig	B	83[4]		22[4]	
25		C	63[3]		37[3]	
26		S	92[3]		8[3]	
27	Rabbit	B	86[4]		19[4]	
28		C	70[4]		40[4]	
29		S	93[3]	92-94[3]	6.7[3]	6.0-7.8[3]
30	Rat	B	86[4]	84-87[4]	20[4]	19-22[4]
31		P	95[4]		7.8[4]	
32	Sheep	B	87[4]		19[4]	
33		C	67[4]		42[4]	
34		S	92[3]		8.3[3]	

/1/ Determined by oven-drying methods unless specified otherwise. /2/ 75 (73-76) g/100ml RBC, and 95 (95-96) g/100ml plasma by distillation method. /3/ As grams per 100 grams. /4/ Source data presented in terms of g/100 g; calculated to grams per 100ml by application of values for specific gravity of blood, plasma, or cells. Solids calculated as (100-water content)% *by weight, then* calculated to g/100ml as above. /5/ Parentheses enclose values calculated on basis of standard hematocrit values and contents in cells and plasma.

68. BLOOD CARBOHYDRATES AND RELATED SUBSTANCES

Blood (B), R B C (C), Plasma (P), Serum (S), Leukocytes (L), Celomic fluid (F)

	Constituent (A)	Animal (B)		mg/100ml Value (C)	mg/100ml Range (D)
1		Man, fasted	B[1]	90	80-100[b]
2		Man, fasted	B[2]	86	76-96[b]
3		Man	C	74[3,4]	46-102[3,4]
4		Man	S	97[3,4]	61-130[b,3,4]
5		Man, newborn	B		20-30[5,6]
6		Man, fetus	B		36-116[b,7]
7		Calf	C	48[3,4]	
8		Calf	S	118[3,4]	
9		Camel	B	48	
10		Camel	S	108	
11		Cat, fasted	B	74[3,8]	64-84[b,3,8]
12		Cat	C	76[3,4]	
13		Cat	S	297[3,7]	
14	Glucose	Cattle	B	46[9]	36-57[9]
15		*Dog*	*B*	*60*[9]	*44-78*[9]
16		Dog, fasted	B	77[5,6]	67-87[5,6]
17		Dog	C	41[3,4]	
18		Dog	S	132[3,4]	
19		Fox	B	104	70-134
20		Guinea pig, fasted	B	95[5,10]	60-125[b,5,10]
21		Guinea pig	B	96[5,10]	82-107[b,5,10]
22		Guinea pig	C	53[3,4]	
23		Guinea pig	S	155[3,4]	
24		Horse	B	73[9]	54-95[9]
25		Mink	B	122	72-172[b]
26		Monkey	C	119[3,4]	
27		Monkey	S	148[3,4]	
28		Mouse, fasted	B	109[3,8]	75-143[b,3,8]
29		Mouse	B	174[3,8]	82-266[b,3,8]

	Constituent (A)	Animal (B)		mg/100ml Value (C)	mg/100ml Range (D)
30		Opossum	C	81[3,8]	73-89[b,3,8]
31		Opossum	P	123[3,8]	107-139[b,3,8]
32		Ox	C	15[3,4]	
33		Ox	S	85[3,4]	
34		Pig	C	0[3,4]	
35		Pig	S	90[3,4]	
36		Rabbit	B	85[5,11]	67-107[5,11]
37		Rabbit	C	41[3,4]	
38		Rabbit	S	145[3,4]	
39		Rat, Wistar	B	66[5,4,10]	56-76[b,5,10]
40		Rat, Yale	B	85[3,4,10]	78-93[b,5,10]
41		Sheep	*B*	35[5,4,10]	18-57[5,10]
42		Sheep	C	10[3,4]	
43		Sheep	S	80[3,4]	
44	Glucose	Sheep, fetus	B	20[12]	
45		Chicken	B	170[5,10]	126-204[5,10]
46		Duck	B	114[5,11]	90-138[b,5,11]
47		Owl	B		200-350[5,10]
48		Pigeon, fasted	B	152[5,11]	117-189[b,5,11]
49		Alligator, fasted	B	99[5,13]	21-205[3,13]
50		Philodryas	B	63	25-111[b]
51		Pit viper, male	B	67	46-88[b]
52		Pit viper, *female*	B	*60*	22-98[b]
53		Frog	B	42	36-49[b]
54		Carp, fresh water	B		98-256
55		Eel	B		44-141
56		Gastrophilus intestinalis, larva	B	0[12]	

/1/ Arterial blood. /2/ Venous blood. /3/ *Tungstic* acid filtrate. /4/ Fermentation. /5/ Zinc hydroxide filtrate. /6/ Ferricyanide-iodometric titration. /7/ Fermentable sugar in cord blood. /8/ Color formation with ferric ferrocyanide. /9/ "True blood sugar". /10/ Copper-iodometric titration. /11/ Color formation with copper arsenomolybdate. /12/ "Non-fructose, fermentable reducing substance". /13/ *Copper molybdate color formation.*

68. BLOOD CARBOHYDRATES AND RELATED SUBSTANCES (Continued)

Blood (B), R B C (C), Plasma (P), Serum (S), Leukocytes (L), Celomic fluid (F)

	Constituent	Animal		mg/100ml Value	mg/100ml Range
	(A)	(B)		(C)	(D)
57	Glucose or Fructose[3,4,10,14]	Arenicola	P	12	
58		Dasybranchus	F	8	
59		Sipunculus	F		2.5-8.7
60		Carcinus	P		7.5-26
61		Carcinus, fasted	P	0	
62		Cancer	P	22	
63		Crayfish	P		1-4
64		Bombyx	P	16	
65		Hydrophilus	P		6-31
66		Mollusc	P		2.1-8.7
67	Fructose	Man	S	7.5[4,5,15]	
68		Man, fetus	B		0-1
69		Sheep, fetus	B	70	12-128[6,16]
70		Gastrophilus intestinalis, larva	B	171[5,17]	
71		pupa, 10-11th day	B	22[5,17]	
72		Blowfly	B	0[5,17]	
73		Grasshopper	B	0[5,17]	
74		Waxmoth, larva	B	0[5,17]	
75	Lactose[3,13,18]	Man	B		0-trace
76		Woman, pregnant	P		0-trace
77		Woman, lactating, 3-8 days post-partum	P		0-2
78	Glycogen[10,19]	Man	B	5.5	1.2-16.2
79		Man	L	2.5	1.0-3.8
80		Man	P	0	
81	Glycogen[10,19]	Man	C	0	
82		Horse	L	3.3	0.5-11.2
83		Dog	L	3.1	
84	Glucosamine[20]	Man	S	67	61-78
85		Man, aged	S	81	70-89
86		Man, 3-8 yr	S	63	52-69
87		Man, fetus	S	48	42-55
88		Rabbit	S	71	51-91
89	Polysaccharide[21]	Man	S	102[22]	73-131[22]
90		Man	S	111	93-126
91		Man, aged	S	129	104-138
92		Man, 3-8 yr	S	105	94-118
93		Man, fetus	S	80	62-103
94		Rat	S	167	
95	Pentose[23,24] total	Man	P	3.7[25]	2.6-4.8[25]
96		Rat, fasted	P	5.4	4.4-6.4
97		Rabbit, fasted	P	5.3	2.9-7.7
98	Pentose, phosphorylated	Man	P	2.1	
99		Rabbit	P	2.9	1.5-4.3
100	Hexuronate[26]	Man	B	6.7[27]	4.1-9.3[6,27]
101		Man	C	0.6	
102		Man	P	0.8	
103		Rat	P	0.9	0.5-1.3
104		Rat	C	0.4	
105		Rabbit	P	1.4	0.0-3.0
106		Rabbit	C	0.7	0.0-1.9

/14/ "Fermentable reducing sugar." /15/ Color development with diphenylamine. /16/ Cadmium hydroxide filtrate. /17/ Color development with resorcinol. /18/ Destruction of non-lactose sugar by B. proteus. /19/ Cells hemolyzed in water, digested with KOH; precipitation with alcohol, hydrolysis. /20/ Color development with acetylacetone on hydrolysate of alcohol precipitate. /21/ Absorption at 500 mμ by product of tryptophan reaction with acidified alcohol precipitate. /22/ Carbazole reaction with alcohol-precipitated, acid-treated serum. /23/ Trichloroacetic acid filtrate. /24/ Quantitative orcinol reaction. /25/ 2.6 on saline extract of acetone precipitate. /26/ As glucuronic acid, color development with naphtho-resorcinol, with preliminary hydrolysis but without deproteinization, unless specified otherwise. /27/ Tungstate-sulfuric acid filtrate.

68. BLOOD CARBOHYDRATES AND RELATED SUBSTANCES (Continued)

Blood (B), R B C (C), Plasma (P), Serum (S), Leukocytes (L), Celomic fluid (F)

	Constituent	Animal		mg/100ml Value	mg/100ml Range
	(A)	(B)		(C)	(D)
107	Ribonucleic acid[28]	Man	B	(64)	(48-79)
108		Man	C	136	102-170
109		Man	P	4.9	3.9-5.9
110		Chicken	C	1156	772-1540[b]
111		Duck	C	1530	
112		Goose	C	1360	
113	Desoxyribonucleic acid[29]	Man	P	0.8	0-1.6[b]
114		Man	C	Trace	
115		Man	L	6.84/1 million	
116		Chicken	C	3060	2782-3338[b]
117		Duck	C	2590	
118		Goose	C	3760	
119	Adenosine triphosphate	Man	B	44[30]	31-57[b,30]
120		Man, male	B	46[31]	38-54[b,31]
121		Man, female	B	39[31]	30-48[b,31]
122		Man	C	72[32]	
123		Guinea pig	B	28[30]	
124		Guinea pig	C	58[33]	
125		Cat	B	14[30]	
126		Cat	C	52[33]	
127		Cattle	C	27[33]	
128		Dog	B	19[30]	11-27[b,30]
129		Dog	C	53[33]	
130		Horse	C	18[33]	
131		Pig	B	65[30]	
132		Pig	C	115[33]	
133		Rabbit	B	54[30]	44-64[b,30]
134		Rabbit	C	112[33]	
135		Rat	B	38[30]	
136	Adenosine triphosphate	Rat	C	77[33]	
137		Sheep	B	17[30]	
138		Sheep	C	45[33]	
139		Chicken	B	27[33]	
140		Chicken	C	57[34]	
141		Duck	C	120[30]	
142		Pigeon	C	182[33]	
143		Turtle, sea	B	37[30]	
144		Turtle, snapping	C	96[33]	
145		Alligator	C	47[33]	
146		Frog	B	14[34]	
147		Frog	C	23.5[34]	
148		Frog	P	0[34]	
149		Snakes	C	562[33]	
150		Catfish	C	167[33]	
151	Adenosine diphosphate	Chicken	B	0[34]	
152		Frog	B	0[34]	
153	Adenylic acid	Chicken	B	0[34]	
154		Frog	B	0[34]	
155	Pyridine nucleotides[35]	Man	B	3.6	2.6-4.6
156		Man	C	7.7	6.1-9.3
157	F. A. D.[36]	Man	P	0.012	
158		Man	C	0.075	0.069-0.081
159	Diphosphoglyceric acid[37]	Man	C	120	
160		Cat	C	17	
161		Dog	C	133	
162		Horse	C	140	
163		Pig	C	190	
164		Rabbit	C	194	

/28/ Alkali-treatment, precipitation with trichloroacetic acid; determination of inorganic phosphorus. /29/ Alkali-treatment, precipitation with trichloroacetic acid, determination of phosphorus fractions. /30/ Trichloroacetic acid filtrate, determination of "7 minutes hydrolyzable phosphorus" and determination of purine in adenylic acid; precipitation of nucleotide by uranium acetate, nitrogen determination on copper bisulfite precipitate of acid hydrolysate. /31/ Trichloroacetic acid filtrate, purine precipitated by silver nitrate from hydrolysate of uranium precipitated nucleotide, density read by nephelometer. /32/ Trichloroacetic acid filtrate, determination of inorganic phosphorus liberated by sulfuric acid in 8 minutes. /33/ 8 minutes phosphorus; also see /28/. /34/ Perchloric acid filtrate; measurement of inosinic acid in spectrophotometer after conversion by hexokinase, myokinase and aldolase. /35/ Formation of fluorescent product with alkali-acetone. /36/ Flavine Adenine Dinucleotide; assay by oxygen uptake of dl-alanine in presence of excess d-amino acid oxidase.

68. BLOOD CARBOHYDRATES AND RELATED SUBSTANCES (Concluded)

Blood (B), R B C (C), Plasma (P), Serum (S), Leukocytes (L), Celomic fluid (F)

	Constituent	Animal		mg/100ml Value	mg/100ml Range
	(A)	(B)		(C)	(D)
165	Diphosphoglyceric acid[37]	Rat	P	146	
166		Sheep	C	<3.5	
167		Birds	C	0	
168		Reptiles	C	0	
169		Fish	C	0	
170	Phytic acid[38]	Mammals	C	0	
171		Chicken	C	251	
172		Duck	C	264	
173		*Pigeon*	C	285	
174		Turtle	C	95	
175	Lactic acid	Man	B	24[39]	
176		Man	C	12[39]	
177		Man	P	36[39]	
178		Man	B	19[40]	0-41[40]
179		Dog	B	19[39]	7-29[39]
180		Dog	C	22.5[39]	8.5-37[39]
181		Rat	B	13[39]	5-21[39]
182		Sheep	B	21[39]	
183		Carp	B	16[39]	13-19[b,39]
184	Pyruvic acid	Man	B	0.3[41]	
185		Man	P	1.2[42]	0.4-2.0[b,42]
186		*Guinea pig*	P	2.3	
187		Rabbit	P	1.9[42]	
188		Rat	P	1.9[42]	
189	Alpha-ketonic acids[43]	Man	B	1.3	0.0-3.1
190		Man, infant	B	0.8	0.6-1.0
191		Dog	B	1.0	0.7-1.3
192		Rabbit	B	1.0	
193		Rat	B	1.1	
194		Pigeon	B	0.9	
195	Alpha-ketoglutaric acid	Man	B	0.2[41]	
196		Man	P	0.9[44]	
197	Citric acid	Man, adult	S	2.4[45]	1.6-3.2[b,45]
198		Man, child	S	2.8[45]	1.8-3.8[b,45]
199		Man, newborn	S		3-6[45]
200		Man	B	1.9[46]	1.3-2.5[b,46]
201		Man	P	2.2[46]	1.4-3.0[b,46]
202	Malic acid	Man	P	0.5[47]	0.1-0.9[b,47]
203	Fumaric acid	Rat	B	<0.3[48]	
204	Succinic acid	Man	P	0.5	
205	Ascorbic acid[49]				

/37/ Color formation with naphtho-resorcinol after precipitation by lead acetate. /38/ Precipitation as calcium salt, determination of phosphorus. /39/ Tungstic acid filtrate, oxidation by Mn^{+++} to acetaldehyde and titration of bound bisulfite with iodine. /40/ Conversion to acetaldehyde by concentrated sulfuric acid, color formation with para-hydroxy diphenyl; cutaneous blood *from finger tip.* /41/ Separation of dinitrophenylhydrazone by chromatography prior to color formation with sodium carbonate. /42/ Color formation with sodium carbonate. /43/ Formation and extraction of dinitro-phenylhydrazone; color formation with sodium carbonate. /44/ Oxidation to succinic acid, manometric measurement with succinic dehydrogenase. /45/ Formation of penta-bromo-acetone, color formation with sodium sulfide. /46/ Measurement of bromine in penta-bromo-acetone by reaction of bromate with iodine. /47/ Formation of fluorescent compound with orcinol. /48/ Chromatographic separation in column of silica gel, titration with alkali. /49/ *See table on Blood Vitamin Content.*

69. BLOOD LIPIDS

Blood (B), RBC (C), Plasma (P), Serum (S)

	Constituent	Animal		Lipids mg/100 ml Value	Lipids mg/100 ml Range
	(A)	(B)		(C)	(D)
1	Lipids, total[1,2]	Man	B	(559)[3]	(397-722)[3]
2		Man	C	596	411-781[b]
3		Man	P	530	385-675[b]
4		Cat	P	376	145-607[b]
5		Chicken	P	520	341-699[b]
6		Cow	P	348	185-511[b]
7		Dog	P	580	47-725[d]
8		Goat	P	300	
9		Guinea pig	P	169	94-244[b]
10		Rabbit	P	243	69-417[b]
11		Rat	P	230	69-417[b]
12	Neutral fat[2]	Man	B	134	85-237[b]
13		Man	C	93	11-148[b]
14		Man	P	142	24-260[b]
15		Cat	P	108	0-245[b]
16		Chicken	P	225	63-387[b]
17		Cow	P	105	0-230[b]
18		Guinea pig	P	73	0-146[b]
19		Rabbit	B	(78)[3]	(4-155)[3]
20		Rabbit	C	41	0-86[b]
21		Rabbit	P	105	7-203[b]
22		Rat	P	85	26-144[b]
23	Phospholipid[2]	Man	B	(247)[3]	(186-309)[3]
24		Man	C	350[4]	280-420[4b]
25		Man	P	165	110-220[b]
26		Cat	P	132	21-243[b]
27		Chicken	P	155	84-226[b]
28		Cow	P	84	17-151[b]
29		Cow	S	80	
30		Guinea pig	P	51	25-77[b]
31		Pig	P	96	80-130[d]
32	Phospholipid[2]	Rabbit	B	(145)[3]	(93-204)[3]
33		Rabbit	C	240	191-289[b]
34		Rabbit	P	78	13-143[b]
35		Rat	P	83	36-130[b]
36		Sheep	P	90	24-123[b]
37	Lecithin	Man	B	(115)[3]	
38		Man	C	(70)[6]	
39		Man	P	117[5]	
40		Man	S	107	50-204
41		Cow	S	54	
42		Dog	P	370	300-470[d]
43		Dog	S	288	
44		Pig	S	72	
45		Rabbit	C	86	56-116[b]
46	Cephalin	Man	B	65	31-118
47		Man	C	(210)[6]	
48		Man	P	7[5]	
49		Cow	S	3	
50		Dog	P	22	
51		Pig	S	3	
52		Rabbit	B	(60)[3]	
53		Rabbit	C	107	64-150[b]
54		Rabbit	P	27	
55	Sphingomyelin	Man	B	186	
56		Man	C	(70)[6]	
57		Man	P	41[5]	
58		Cow	S	22	
59		Dog	S	55	
60		Pig	S	21	
61		Rabbit	B	(42)[3]	
62		Rabbit	C	47	35-59[b]
63		Rabbit	P	38	
64	Cholesterol[2]	Man	B		129-228
65		Man	C	173	118-228
66		Man	P	152	105-199[b]

(Continued on the next page)

/1/ Total lipids = Cholesteryl esters + Free Cholesterol + Phospholipid + Neutral Fat. /2/ Determined by oxidimetric methods on oxalated blood of fasted animals, unless specified otherwise /3/ Parentheses ( ) enclose values calculated on basis of hematocrit and content of constituent in blood, cells or plasma /4/ Phospholipid P (determined by [illegible] ospholipid fractions of [illegible] Difference between total [illegible] regarded as difference between total and choline-containing lipids [illegible] a measure of sphingomyelin. Lecithin is choline-containing phospholipids less sphingomyelin /6/ Values calculated on basis of following probable approximate partition of total phospholipid in human red blood cells cephalin, 60%, lecithin, 20%, sphingomyelin 20%

69. BLOOD LIPIDS (Concluded)

	Constituent	Animal	Blood (B), RBC (C), Plasma (P), Serum (S)	Lipids mg/100 ml Value	Lipids mg/100 ml Range
	(A)	(B)		(C)	(D)
67	Cholesterol[2]	Chicken	P	100	52-148b
68		Cat	P	93	43-143b
69		Cow	P	110	8-212b
70		Dog	P	173	138-214d
71		Goat	P		46-95d
72		Guinea pig	P	32	21-43b
73		Horse	S	77	
74		Monkey	S	118	
75		Mouse, male	B	180[8]	149-244[8]
76		Mouse, female	B	148[8]	132-166[8]
77		Rabbit	B	(82)[3]	(54-110)[3]
78		Rabbit	C	133	115-151b
79		Rabbit	P	45	10-80b
80		Rat	P	52	28-76b
81	Cholesterol, free	Man	B		82-113
82		Man	C	140	119-161b
83		Man	P	46	30-62b
84		Cat	P	30	9-51b
85		Chicken	P	34	15-53
86		Cow	P	37	0-85b
87		Dog	P	134	103-159d
88		Guinea pig	P	11	7-15b
89		Horse	S	47	
90		Rabbit	B	(68)[3]	(48-90)[3]
91		Rabbit	C	133	115-151b
92		Rabbit	P	22	0-47b
93		Rat	P	21	5-37b
94	Cholesterol esterified	Man	B		47-115
95		Man	C	0	
96		Man	P	106	75-137b
97		Cat	P	73	25-121b
98	Cholesterol, esterified	Chicken	P	66	26-106b
99		Cow	P	73	25-121b
100		Dog	P	39	35-55
101		Guinea pig	P	21	12-30b
102		Horse	S	30	
103		Rabbit	B	(9.2)[3]	(0-28)[3]
104		Rabbit	C	0	
105		Rabbit	P	22	0-47b
106		Rat	P	31	11-51b
107	Cholesteryl esters[7]	Man	B		79-194
108		Man	C	0	
109		Man	P	179	127-232
110		Cat	P	106	25-188
111		Chicken	P	112	44-179
112		Cow	P	123	42-204
113		Dog	P	66	59-93
114		Guinea pig	P	15	9-22
115		Horse	S	51	
116		Rabbit	C	0	
117		Rabbit	P	37	0-79
118		Rat	P	52	19-86
119	Fatty acids, 2 total	Man	P	316	149-483b
120		Cat	P	228	56-400b
121		Chicken	P	361	206-516b
122		Cow	P	202	26-378b
123		Guinea pig	P	116	92-140b
124		Rabbit	P	169	40-298b
125		Rat	P	153	108-198b
126	from neutral fats = 0.95 x neutral fats				
127	from phospholipids = 0.65 x Phospholipids				
128	from cholesteryl esters = 0 43 x cholesteryl esters				

/7/ Cholesteryl esters = 1 69 x esterified cholesterol /8/ Determined by Sperry-Schoenheimer method, or modification

70. BLOOD PROTEINS: MAN

	Constituent	Blood		Erythrocytes		Plasma[1]	
		Value	Range	Value	Range	Value	Range
		g/100ml	g/100ml	g/100ml	g/100ml	g/100ml	g/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
1	Protein, total	20.5		36.8		7.41	
2	Hemoglobin	14.9[2]		33.5[3]	30-40[b]	trace	0.001-0.005
3	Corpuscle stroma	1.5[3]		3.3			
4	Plasma protein	4.1[3]		—	—	7.41	
5	Fibrinogen	0.16[3]		—	—	0.28	0.23-0.36[d]
6	Serum protein	3.9[3]		—	—	7.13	6.4-7.9[b]

/1/ Salt fractionation methods. /2/ Average of male, value = 15.8 (range = 14-18[b]) and female, value = 13.9 (range = 11.5-16[b]). /3/ Calculated on the basis of hematocrit value of 44.5% (see Table 37).

71. PLASMA PROTEINS: MAN

	Constituent	Salt Fractionation Method[1]			Salt Fractionation Method[2]			Electrophoretic Method			Electrophoretic Meth. (Corrected)[3]	
		Value		Range	Value		Range	Value		Range	Value	
		%	g/100ml	g/100ml	%	g/100ml	g/100ml	%	g/100ml	g/100ml	%	g/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
1	Plasma protein, total	100	7.48		100	7.41		100	7.30		100	6.58
2	Fibrinogen	3.7	0.28[4]	0.23-0.36[d4]	3.8	0.28[4]	0.23-0.36[d4]	4.0	0.29		4.7	0.31
3	Serum protein, total	96.3	7 2	6.5-7.9	96 2	7.13	6.4-7.9[b]	96.0	7.01	6.3-7.7[b]	95.3	6.27
4	Albumin	69.5	5.2	4.7-5 7	61.8	4.58	4.1-5.1[b]	60.5	4.42	4.0-4.8[b]	50.1	3.30
5	Globulin, total	26.8	2.0	1.3-2.5	34.4	2.55	1.8-3.3[b]	35.5	2.59		45.2	2.97
6	$Alpha_1$-globulin							4.0	0.29	0.2-0.4[b]		
7	$Alpha_2$-globulin							7.7	0.56	0.4-0.7[b]	14.0	
8	Beta-globulin							11.5	0.84	0.6-1.1[b]	19.3	1.27
9	Gamma-globulin							12.3	0.90	0.6-1.2[b]	11.9	0.78
10	Euglobulin	2.7	0.2	-0.4	21.4	1.59	0.9-2.2[b]					
11	Pseudoglobulin, total	24.1	1.8		13.0	0.96	0.6-1.35[b]					
12	Pseudoglobulin I	17.4	1.3	0.8-1.9								
13	Pseudoglobulin II	6.7	0.5	0.2-0.8								
14	Albumin/globulin ratio		2.6			1.8			1.71	1.3-2.2[b]		1.1

/1/ Method of Howe, P.E., 1921. /2/ Milne-Majoor method, 1947 /3/ Corrected for nitrogen factor, refractive increment differences, ionic strength, total protein concentration effects. Red Cross pooled plasma used, corrected for dilution with citrate. /4/ Value not from Milne-Majoor or Howe. See bibliography.

72. PLASMA PROTEINS[1]: ANIMALS OTHER THAN MAN

	Animal	Plasma Protein Total g/100ml		Fibrinogen g/100ml		Serum Protein Total g/100ml		Albumin g/100ml		Globulin g/100ml	
		Value	Range	Value	Range	Value	Range	Value	Range	Value	Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1	Cat					7.58	6.1-9.0[b]	4.01	3.5-4.6[b]	3.57	2.1-5.0[b]
2	Chicken					3.60	2.6-4.6	1.82		1.78	
3	Cow	8.32	7.4-10.2	0.72		7.60[2]		3.63[2,3]		3.97[2,3]	
4	Dog	6.72	6.1-7.8	0.52	0.42-0.64	6.20[2]	4.9-7.9	3.57[2,4]	3.1-4.0	2.63[2,4]	2.0-3.3
5	Goat	7 27		0.60		6.67[2]		3.96[2,5]		2.71[2,5]	
6	Guinea pig	4.70		0.33		4.37		3.03		1.34	
7	Horse	6.84		0.34	0.29-0.43	6.50[2]		3.25[2,6]		3.25[2,6]	
8	Monkey	5.82		0.32	0.25-0.40	5.50					
9	Mouse					6.02	5.84-6.20[b]	4.50		1.52	
10	Rabbit					5.70[2]		4.20[2,7]		1.50[2,7]	
11	Rat	6.29		0.25	0.16-0.34[b]	6.04	5.5-6.5[b]	3.86	3.4-4.3[b]	2.18	1.8-2.5[b]
12	Sheep	5.74		0.36		5.38		3.07		2.31	
13	Swine					6.30		2.03		3.27	

/1/ The data represent chemical methods (salting-out, colorimetric, etc.); in most instances 6.25 used as Nitrogen factor in calculating protein. "Fraction V," precipitated with the albumin in the Howe salting-out method, should be subtracted from the albumin and added to the globulin to permit comparison with results of later methods. /2/ Total serum protein partitioned into albumin and globulin by means of average of measured A/G ratios. /3/ A/G = 0.92. /4/ A/G = 1.36. /5/ A/G = 1.46. /6/ A/G = 1.0. /7/ A/G = 2.80.

73. PLASMA PROTEINS, CERTAIN PROPERTIES AND REACTIONS: MAN

	Classification	Purified Protein Component	Electrophoretic Fraction	Interacts with	General Properties
	(A)	(B)	(C)	(D)	(E)
1	Blood coagulation agents	Antihemophilic globulin			Clots hemophilic blood
2		Fibrinogen		Thrombin	Forms fibrin clot
3		Plasmin		Proteins	Dissolves plasma clot
4		Plasminogen		Streptokinase	Enzyme precursor
5		Prothrombin		Thromboplastin	Enzyme precursor
6		Thrombin		Fibrinogen	Catalyzes formation of fibrin clot
7	Serological agents	Antibody gamma-	Gamma-globulin	Antigens	Antibodies for pathogenic organisms
8		Diphtheria antitoxin	Gamma-globulin	Diphtheria toxin	
9		Antibody euglobulin	Beta- & gamma-globulin	Antigens	Contain typhoid "O" agglutinins
10		Isoagglutinins	Beta- & gamma-globulin	Antigens of incompatible red blood cells	Anti-A, anti-B, & anti-RH agglutinins
11		Complement components C'1, C'2	Alpha- & beta-globulin	Antigen-antibody complex	
12	Enzymes[1]	Choline esterase		Choline esters	
13		Peptidase		l-Leucylglycylglycine	
14		Phosphatase alkaline		Phosphoric acid monoesters	
15		Plasmin (see 3A-E)			
16		Thrombin (see 6A-E)			
17	Hormones	Iodoglobulin	Alpha-globulin		Thyroid-active protein
18		Thyrotrophic hormone	Alpha-globulin		Influences thyroid activity
19	Miscellaneous	Albumin	Albumin	Fatty acids, bile salts, dyes, & drugs	Osmotic regulation of blood volume
20		Mercaptalbumin	Albumin	Mercury	Have sulfhydryl groups
21		$Alpha_1$-lipoprotein	$Alpha_1$-globulin	Steroids	35% lipid
22		$Alpha_1$-bilirubin globulin	$Alpha_1$-globulin	Bilirubin	
23		$Alpha_2$-glycoproteins	$Alpha_2$-globulin	Carbohydrates & barium	
24		$Alpha_2$-muproteins	$Alpha_2$-globulin	Carbohydrates & barium	
25		$Beta_1$-lipoproteins	$Beta_1$-globulin	Estriol, carotenoids, & other steroids	75% lipid, carrier for vitamins & hormones
26		$Beta_1$-metal-combining protein[2]		Iron & Copper	Binds 2 Fe^{+++} or Cu^{++} per molecule[3]
27		$Beta_1$-lipid-poor euglobulins			
28		Caeruloplasmin		Copper	

/1/ Other enzymes include acid phosphatase, amylase, tributyrin esterase, beta-glucuronidase /2/ = Siderophilin, transferrin /3/ Binds iron much more strongly than copper

74. PLASMA PROTEINS, PHYSICAL PROPERTIES: MAN

	Purified Component	Concentrated in Fraction	Estimated Amount g/100 g Plasma Protein	Approx. Iso-electric Point pH	Molecular Weight M	Sedimentation Constant $S_{20,w}$	Specific Volume V	Intrinsic Viscosity $H_0 \cdot 10^2$	Frictional Ratio f/f_o	Approx. Dimensions Ångström Units: Length	Approx. Dimensions Ångström Units: Diameter
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1	Antihemophilic globulin	I									
2	Cold-insoluble globulin[1]	I-1	0.15	<5.3							
3	Fibrinogen	I-2	4	<5.3	400,000	9		25	1.98	700	38
4			11 { 9	6 3	156,000	7	0.739	6	1.38	235	44
5	Gamma-globulins	II	2	7.3	300,000	10	0.739				
6	Diphtheria antitoxin	II	0.001								
7	$Beta_1$-lipoprotein	III-0	5	5.4	1,300,000	7	0.950	4.1		185	185
8			3 { 2	5.5		7					
9	$Beta_1$-lipid-poor euglobulins	III-0	1	5.5		20					
10	Caeruloplasmin	III-0		4.4							
11	Isoagglutinins	III-1	} 0.03	6.3							
12	Antibody euglobulins	III-1									
13	Prothrombin	III-2	0.1								
14	Complement components, C'1, C'2	III-2&IV	0.4								
15	Plasminogen	III-3									
16	Plasmin	III-3									
17	$Beta_2$-globulins	III	3	6 3		7					
18	$Alpha_1$-lipoprotein	IV-1	3	5.2	200,000	5	0.841	6.6	1.38	300	50
19	Thyrotrophic hormone	IV-4									
20	$Alpha_2$-glycoprotein	IV-6	1.2	4.9		9					
21	$Alpha_2$-mucoprotein	IV-6	0 5	4.9		9					
22	Cholinesterase	IV-6	0.005	4 5							
23	Peptidase	IV									
24	Phosphatase, alkaline	IV									
25	Iodoglobulin	IV-6									
26	$Beta_1$-metal combining protein	IV-7	3	5.8	90,000	5	0.725	5.5	1.37	190	37
27	Albumin, serum	V	52	4.9	69,000	4.6	0.733	4.2	1.28	150	38
28	Mercaptalbumin	V	34								
29	$Alpha_1$-bilirubin globulin	V-1	0.05	4.7							
30	$Alpha_2$-protein	VI-1	0.1			2.9					
31	$Beta_1$-protein	VI-1	0.05			5					
32	$Alpha_1$-small acid protein[2]	VI-2	0 5	3.0		3.5					

/1/ Non-clottable protein, insoluble at low temperature. /2/ Acid glycoprotein.

75. BLOOD FREE AMINO ACIDS[1]

	Constituent	Animal	100 ml Blood mg		100 ml RBC mg		100 ml Plasma[2] mg	
			Value	Range	Value	Range	Value	Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
1	Alanine	Man	4.0	2.8-5.2[b]	4.0	2.5-5.6[b]	4.0[3]	2.6-5.3[b]
2		Mouse					5.9	5.3-6.6
3		Rat	12.3	9.0-15.6[b]				
4	Arginine	Man	1.0	0.6-1.7[b]	0.3	0.1-0.6[b]	2.3	1.1-3.5[b]
5		Dog	3.7	1.7-5.2	4.2		3.3[3]	1.8-4.8[b,4]
6		Mouse					0.97	0.9-1.0
7		Rat					3.9	2.7-4.9[b,5]
8	Aspartic acid	Man						0.9-1.2
9	Citrulline[6]	Man						0.3-1.0
10		Dog						0.8-1.5
11	Cysteine	Horse	0.3		0.5		0.2	
12	Cystine	Man	0.9	0.6-1.2[b]	0.4	0.3-0.5[b]	1.4	0.8-2.0[b]
13		Dog					0.9	0.5-1.5
14		Horse					1.6	
15		Pig						0.6-0.9
16		Rabbit						0.9-1.1
17		Rat						0.7-0.9
18	Glutamic acid	Man					0.8[7,8]	0.6-1.7[7]
19		Cat					2.1	
20		Dog					<0.6	
21		Mouse					3.3	2.9-3.6
22	Glycine	Man		1.8-2.5	2.4	1.6-3.1[b]	1.8	1.3-2.3
23		Guinea pig					2.5	
24		Mouse					1.9	1.7-2.3
25		Rabbit					4.0	
26		Rat					3.1	1.5-4.6[b,5]
27	Histidine	Man	1.3	0.9-1.7	1.1	0.8-1.6	1.4	1.1-1.8[b]
28		Dog	1.3	1.0-2.0			1.2	0.9-1.6[b]
29		Mouse					1.6	1.4-1.7
30		Rat					1.2	0.9-1.5[b,5]
31	Isoleucine	Man	1.3	0.9-1.5	0.9	0.5-1.4	1.6	1.0-2.2[b]
32		Dog	1.8	1.2-2.2[b]			1.3	0.5-2.1[b]
33		Mouse					1.5	1.2-2.0[b]
34		Rat					1.4	0.7-2.5[b,5]
35	Leucine	Man	1.7	1.4-2.0[b]	1.5	1.0-1.8[b]	1.9	1.3-2.5[b]
36		Dog	2.5	1.2-3.6			2.1	1.6-2.8
37		Mouse					2.4	2.2-2.8
38		Rat					2.1	1.1-3.1[b,5]
39	Lysine	Man	2.2	1 3-3.0[b]	1.4.	0.9-1.8[b]	3.0	2.1-3.8[b]
40		Dog	2.5	1.6-3.6			2.4	1.3-3.6[b]
41		Goat					1.8	1.3-2.4
42		Mouse					6.4	5.7-7.0
43		Rat					7.2	4.0-10.4[b,5]
44	Methionine	Man	0 5	0 4-0.6[b]	0.5	0.3-0.8[b]	0.5	0.3-0.6[b]
45		Dog	1.2	0.8-1 7				0.2-1.9
46		Mouse					1.9	1.7-2.2
47		Rat					1.0	0.6-1.3[b,5]

Note See footnotes on next page (Continued on the next page)

75. BLOOD FREE AMINO ACIDS[1] (Concluded)

	Constituent	Animal	100 ml Blood mg Value	100 ml Blood mg Range	100 ml R B C mg Value	100 ml R B C mg Range	100 ml Plasma[2] mg Value	100 ml Plasma[2] mg Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
48	Phenylalanine	Man	1.0	0.8-1.2[b]	1.0	0.7-1.3[b]	1.4	0.5-2.2[b]
49		Dog	1.5	0.9-2.5			1.2	
50		Mouse					2.4	2.0-3.2
51		Rat					1.1	0.7-1.5[b,5]
52	Proline	Man						2.4-2.7
53		Mouse					1.8	1.6-2.1
54		Rat					3.6	3.3-3.9[b,5]
55	Threonine	Man	1.6	1.3-2.0[b]	1.6	1.3-2.1[b]	2.0	1.1-2.9[b]
56		Dog	2.4	1.2-3.3			2.6	1.2-4.0[b]
57		Mouse					3.5	3.0-3.9
58		Rat					4.2	2.3-6.2[b,5]
59	Tryptophan	Man	0.7	0.5-1.0[b]	0.24	0.2-0.4[b]	1.1	0.7-1.5[b]
60		Cow					1.1	0.8-1.2
61		Dog	1.2	0.6-2.4			1.2	0.8-1.5
62		Horse					1.2	
63		Mouse					2.1	1.5-2.6
64		Pig					1.1	1.0-1.2
65		Rat	1.6	1.5-2.0			1.5	0.8-2.1[b,5]
66		Sheep					1.1	0.8-1[b]
67	Tyrosine	Man	1.1	0.8-1.4[b]	1.1	0.7-1.5[b]	1.5	0.8-2.2[b]
68		Dog	1.2	0.7-2.0			1.1	0.6-1.5[b]
69		Goat					1.2	1.0-1.5
70		Mouse					2.5	2.4-2.7
71		Rat					1.5	0.8-2.2[b,5]
72	Valine	Man	2.4	2.0-2.9[b]	2.0	1.6-2.5[b]	2.8	2.2-3.5[b]
73		Dog	2.6	1.5-4.1			2.2	1.2-3.3[b]
74		Mouse					4.3	3.8-5.0
75		Rat					2.6	1.5-3.6[b,5]

[illegible] ude microbiologically [illegible] /3/ 0.07 mg in beta [illegible] diacetyl method. /7/ [illegible] method, corrected for glutamine.

76. BLOOD NON-PROTEIN NITROGEN COMPOUNDS

Blood (B), R B C (C), Plasma (P), Serum (S).

	Constituent	Animal	Non-Protein N Compounds per 100 ml		
				Value mg	Range mg
	(A)	(B)		(C)	(D)
1	*Amino Acids*[1]	Man	B	50	38-53
2	Ammonia	Man	B	0.18	0.12-0.24
3	Bilirubin	Man	B	0.18	0.1-0.25
4	Creatine	Man	B	3.9	2.9-4.9[b]
5		Man	C	8.1	6.0-10.2[b]
6		Man	P	0.23	0.0-0.8[b]
7		*Chicken*	B	2.1	
8	Creatinine	Man	B	1.5	1.0-2.0
9		Man	C	1.8	1.7-1.9[b]
10		Man	P	0.91	0.87-0.95[b]
11	Ergothioneine[2]				
12	Glutamine	Man	P		5.0-12.0
13		*Dog*	C		3.8-7.2
14		Dog	P		7 -13
15		Horse	C	7.2	
16	Glutathione[2]				
17	Lecithin[3]				
18	Methyl guanidine	Man	B	0.25	0.2-0.3
19	Nucleotides	Man	B	41	31-52
20	Polypeptides	Man	B	<7	
21	Urea	Man	B	32	24-40[b]
22		Man	C	30	25-39[b]
23		Man	P	34	28-40[b]
24		Man ♂	B	33	26-46
25		Man ♂	P	27	19-36
26		Man ♀	B	24	11-29
27		Rat	P	34	
28		Chicken	B	5.7	
29	Uric Acid	Man	B	3.2	2.2-4.2[b]
30		Man	C	1.9	0.8-3.0[b]
31		Man	P	3.8	2.0-5.6[b]
32		Man ♂	S	4.8	
33		Man ♀	S	4.0	
34		Dog	P	0.33	
35		Rat	B	1.5	0.5-3.4
36		Chicken	B	4.5	
37	Vitamins[4]				

/1/ For details see table on Blood Free Amino Acid Content. /2/ See table on Blood Sulfur Compounds. /3/ See table on Blood Lipid Content. /4/ See table on Blood Vitamin Content.

77. NITROGEN CONTENT OF BLOOD NITROGEN COMPOUNDS

	Compound	g Nitrogen in 1 g Compound		Compound	g Nitrogen in 1 g Compound
	(A)	(B)		(A)	(B)
1	Alanine	0.1572	28	Leucine	0.1068
2	Amino-butanoic acid	0.1358	29	Lysine	0.1916
			30	Methionine	0.0939
3	Ammonia	0.8275	31	Nicotinamide	0.2294
4	Arginine	0.3216	32	Nicotinic acid	0.1138
5	Asparagine	0.2120	33	Norleucine	0.1068
6	Aspartic acid	0.1052	34	Norvaline	0.1196
7	Bilirubin	0.0978	35	Ornithine	0.2120
8	Biliverdin	0.0927	36	Pantothenic acid	0.0639
9	Biotin	0.1147	37	Para-aminobenzoic acid	0.1022
10	Choline	0.1156			
11	Citrulline	0.2499	38	Phenylalanine	0.0848
12	Creatine	0.3205	39	Proline	0.1217
13	Creatinine	0.3715	40	Proteins	0.1600
14	Cysteine	0.1156	41	Pyridoxin	0.0828
15	Cystine	0.1166	42	Pteroylglutamic acid	0.2278
16	Epinephrin	0.7646			
17	Ergothionine	0.1849	43	Riboflavin	0.1489
18	Glucosamine	0.0782	44	Serine	0.1333
19	Glutamic acid	0.0952	45	Thiamin	0.1661
20	Glutamine	0.1917	46	Threonine	0.1176
21	Glutathione	0.1367	47	Thyroxin	0.0180
22	Glycine	0.1866	48	Tryptophan	0.1372
23	Histamine	0.3781	49	Tyrosine	0.1725
24	Histidine	0.2708	50	Urea	0.4665
25	Hydroxyproline	0.1068	51	Uric acid	0.3333
26	Indican	0.0401	52	Valine	0.1196
27	Isoleucine	0.1068			

78. BLOOD PHOSPHORUS, INORGANIC

Blood (B); R B C (C); Plasma (P); Serum (S)

	Animal		Phosphorus mg/100 ml Value	Range[1]
	(A)		(B)	(C)
1	Man	B	2.9[2]	2.1-3.8[2]
2		C	2.4[2]	0.91-3.3[2]
3		P	3.2[2]	2.4-4.4[2]
4	Camel	B	5.6[3]	
5	Cat	B	5.6[4]	4.6-6.9[4]
6	Dog	B	3.1	2.1-4.0
7		P,S	4.4[5]	3.2-6.0[5]
8	Elephant	B	3.4[3]	
9	Goat	B	5.7[4]	4.0-6.1[4]
10	Guinea Pig	B	4.4[4]	2.6-5.7[4]
11	Horse	B	2.3[4]	2.0-2.5[4]
12	Kangaroo	B	4.3[3]	
13	Monkey	B	3.6[4]	
14	Mouse	B	7.4[3]	
15	Opossum	B	3.3	
16	Ox	B	5.8[4]	4.9-7.2[4]
17	Pig	B	8.0[4]	7.2-8.5[4]
18	Rabbit	B	3.3[4]	2.7-3.8[4]
19		P,S	5.0[6]	3.4-6.9[6]
20	Raccoon	B	4.3[3]	
21	Rat	B	5.6[3]	
22		C	4.5[3]	3.3-5.8[3]
23		P,S	7.7[3]	6.0-9.0[3]
24	Sheep	B	6.4[4]	5.7-7.1[4]
25	Canary	B	5.6[3]	
26	Chicken	B	3.5[3]	
27	Duck	B	5.4[3]	
28	Goose	B	5.2[3]	
29	Pigeon	B	6.4[3]	
30	Turkey	B	5.6[3]	
31	Alligator	B	2.9[3]	
32	Snake, moccasin	B	7.0[3]	
33	Snake, water	B	7.0[3]	
34	Turtle, snapping	B	3.3[3]	
35	Frog, bull	B	5.1[3]	
36	Frog, green	B	8.1[3]	
37	Necturus	B	5.3[3]	
38	Bass, black	B	17.1[3]	
39	Catfish	B	7.8[3]	
40	Eel, congo	B	5.6[3]	

/1/ Sample range "c" except as noted. /2/ Oxalated blood; determined by Fiske-Subbarow method. /3/ Heparinized blood; determined by Fiske-Subbarow method. /4/ Oxalated blood; Byrom and Kay partition. /5/ Determined by Gomori method. /6/ Oxalated blood; determined by Kuttner and Lichtenstein method.

79. BLOOD PHOSPHORUS, ORGANIC ACID-SOLUBLE[1]

Blood (B); R B C (C)

	Animal		Phosphorus mg/100 ml Value	Phosphorus mg/100 ml Range		Animal		Phosphorus mg/100 ml Value	Phosphorus mg/100 ml Range
	(A)		(B)	(C)		(A)		(B)	(C)
1	Man	B	23.1[2]	18.6-29 ♀[2]	31	Raccoon	B	(22.2)[4]	
2		C	50[2]	39 -59 ♀[2]	32		C	62[4]	
3	Camel	B	15.3[3]		33	Rat	B	(23.0)[3]	
4		C	63[3]		34		C	50[3]	
5	Cat	B	(8.3)[3]	(7.7-9.1) ♀[3]	35	Sheep	B	(4.5)[3]	
6		C	20.7[3]	19.2-22.7 ♀[3]	36		C	14.0[3]	
7	Dog	B	(26)[3]		37	Canary	B	(61)[4]	
8		C	57[3]		38		C	131[4]	
9	Elephant	B	(15.4)[4]		39	Chicken	B	(30)[4]	
10		C	48[4]		40		C	91[4]	
11	Goat	B	3.5[3]		41	Duck	B	38[3]	
12		C	12.1[3]		42		C	111[3]	
13	Guinea pig	B	(27)[3]		43	Goose	B	(44)[3]	
14		C	65[3]		44		C	101[3]	
15	Horse	B	(16.3)[3]		45	Pigeon	B	(52)[3]	
16		C	47[3]		46		C	120[3]	
17	Kangaroo	B	(27)[4]		47	Turkey	B	(45)[3]	
18		C	53[4]		48		C	94[3]	
19	Monkey	B	(21.5)[4]		49	Alligator	B	(2.4)[4]	
20		C	51[4]		50		C	13.9[4]	
21	Mouse	B	(34)[4]		51	Snake, moccasin	B	(33)[4]	
22		C	85[4]		52		C	165[4]	
23	Opossum	B	(21.8)[4]		53	Turtle, snapping	B	(14.1)[4]	
24		C	51[4]		54		C	59[4]	
25	Ox	B	(3.6)[3]		55	Frog, bull	B	(13.2)[4]	
26		C	9.1[3]		56		C	44[4]	
27	Pig	B	(40)[3]		57	Necturus	B	(18.2)[4]	
28		C	97[3]		58		C	97[4]	
29	Rabbit	B	37[3]		59	Catfish	B	(21.4)[4]	
30		C	88[3]		60		C	57[4]	

/1/ All determinations on whole blood; cell content calculated on basis of blood content of the constituent and the standard hematocrit values. Calculated values are in parentheses ( ). In each of the following groups of figures the first number is the item number in the table, followed by the standard hematocrit value (underscored) and/or the hematocrit value reported by the investigator: (1), 44.5, (3), 24.3; (5), 40, 28.4; (7), 45.5, 34.1; (9), 32.2; (11), 34.5, 28.8; (13) 42.0, 36.4; (15), 35, 41; (17), 49.9; (19), 42, 43; (21), 41.5, 39.8; (23), 42.9; (25), 40, 38.8; (27), 41.5, 41.6, (29), 41.5, 41.6, (31), 36.1, (33), 46.0, 48.8; (35), 32, 31; (37), 46.5; (39), 32, 33.5, (41), 39.5, 44.5; (43), 44, 41; (45), 42.5, 45.1; (47), 38, 40, (49), 17.1, (51), 20.2, (53), 24.1; (55), 30, 30.8; (57), 18.8, (59), 34.6. /2/ Oxalated blood, determined by Lohmann method. /3/ Defibrinated blood, determined by Fiske-Subbarow method. /4/ Heparinized blood; determined by Fiske-Subbarow method.

80. BLOOD ADENOSINE TRIPHOSPHATE PHOSPHORUS[1]

Blood (B); R B C (C)

	Animal (A)		Phosphorus mg/100 ml Value (B)	Phosphorus mg/100 ml Range (C)
1	Man	B	8.1[2]	5.1-10.4[c2]
2		C	18 2[2]	14.3-24.6[c2]
3	Camel	B	3.3[2]	
4		C	13.5[2]	
5	Cat	B	3.8[2]	
6		C	9.6[2]	9-10[2]
7	Dog	B	(4.8)[2]	
8		C	10.7[2]	
9	Elephant	B	4.0[3]	
10		C	12.5[3]	
11	Guinea pig	B	(5.8)[3]	
12		C	13.7[3]	
13	Goat	B	2.5[2]	
14		C	7.3[2]	
15	Horse	B	1.6[2]	
16		C	4.5[2]	
17	Kangaroo	B	4.6[3]	
18		C	9.2[3]	
19	Monkey	B	(5.0)[3]	
20		C	12.0[3]	
21	Mouse	B	(5.9)[3]	
22		C	14.1[3]	
23	Opossum	B	(5.2)[3]	
24		C	12.1[3]	
25	Ox	B	(2.1)[2]	
26		C	5.1[2]	
27	Pig	B	(14.2)[2]	
28		C	34[2]	
29	Rabbit	B	(10.0)[2]	
30		C	24[2]	
31	Raccoon	B	1.4[3]	
32		C	4.0[3]	
33	Rat	B	(6.6)[2]	
34		C	14.4[2]	
35	Sheep	B	(2.9)[2]	
36		C	9.2[2]	
37	Canary	B	24.7[3]	
38		C	53[3]	
39	Chicken	B	(4.7)[2]	
40		C	14.6[2]	11.1-17.7[c2]
41	Duck	B	12.0[2]	
42		C	35[2]	
43	Goose	B	13.9)[3]	
44		C	32[2]	27-34[c3]
45	Pigeon	B	15.4[3]	
46		C	34[3]	31-40[c3]
47	Turkey	B	(9.8)[2]	
48		C	26[2]	
49	Alligator	B	1.5[3]	
50		C	9.0[3]	
51	Snake, moccasin	B	25[3]	
52		C	121[3]	
53	Turtle, snapping	B	4.4[3]	
54		C	18.1[3]	
55	Frog, bull	B	(5.8)[3]	(5.2-6.3)[c3]
56		C	19.4[3]	17.6-20.9[c3]
57	Frog, green	B	5.9[3]	
58		C	21.8	
59	Necturus	B	12.3[3]	
60		C	66[3]	

/1/ All determinations on whole blood, cell content calculated on basis of blood analysis and hematocrit values. Calculated values in parentheses ( ). The following figures represent first, the item, next, the hematocrit, standard (underscored) and/or value reported by investigator (not underscored). (1), 44.5, 45 2, (3), 24.3, (5), 40, 28.1, (7), 45.5, 34.2, (9), 32.2, (11), 42, 36.4, (13) 34.5, 27.7; (15), 35, 41, (17), 49.9; (19), 42, 42.6, (21), 41.5, 40, (23), 42.9, (25), 40, 39, (27), 41.5, 37, (29), 41.5, (31), 36.1; (33), 46, 48.8, (35), 32, 31.1; (37), 46.5, (39), 32, 32.2, (41), 34.5, (43), 44, 47.9; (45), 45.1, (47), 38, 39.7, (49), 13.8, (51), 20 2, (53), 24.1, (55), 30, 30.8; (57), 27 0, (59), 18.8. "Hydrolyzable" phosphorus determined by Lohmann method, liberated P determined by Fiske-Subbarow method; these values were multiplied by 3/2 (Kerr & Daoud; Guest & Rapoport) to derive A.T.P. P values. /2/ Defibrinated blood. /3/ Heparinized blood.

81. BLOOD DIPHOSPHOGLYCERATE PHOSPHORUS[1]

Blood (B), R B C (C)

	Animal		Phosphorus mg/100 ml Value	Phosphorus mg/100 ml Range		Animal		Phosphorus mg/100 ml Value	Phosphorus mg/100 ml Range
	(A)		(B)	(C)		(A)		(B)	(C)
1	Man	B	12 4[2]	8.1-16.7[c2]	19	Monkey	B	(13.0)[3]	
2		C	29[2]	19-40[c2]	20		C	31[3]	28-32[3]
3	Camel	B	10.1[3]		21	Mouse	B	(21 5)[3]	
4		C	29[4]		22		C	53[3]	
5	Cat	B	(1 6)[3]		23	Opossum	B	9 8[3]	
6		C	4.0[4]	3.5-4.5[4]	24		C	22.8[3]	
7	Dog	B	(14 1)[3]		25	Ox	B	<0.3[4]	
8		C	31[3]		26		C	<0.6[4]	
9	Elephant	B	6 0[3]		27	Pig	B	(18.3)[4]	
10		C	18.7[3]		28		C	44[4]	43-45[4]
11	Goat	B	(<0 06)[3]		29	Rabbit	B	(18.8)[3]	
12		C	<0.2[3]		30		C	45[3]	
13	Guinea pig	B	(13 1)[3]		31	Raccoon	B	9.9[3]	
14		C	31[3]		32		C	27[3]	
15	Horse	B	(11 6)[3]		33	Rat	B	(15.6)[3]	
16		C	33[3]	31-33[3]	34		C	34[3]	
17	Kangaroo	B	9 3[3]		35	Sheep	B	<0.3[4]	
18		C	18.6[3]		36		C	<0.8[4]	

/1/ All determinations on whole blood, R B C values calculated on basis of whole blood analyses and hematocrit values. Calculated values in parentheses (). The following figures represent, first, the item, next, the hematocrit value, standard (underscored), and/or the value reported by the investigator (not underscored). (1), 44 5, (3), 34 8, (5), 40, 29, (7), 45 5, 49.8, (9), 32.2, (11), 34.5, 27.7, (13), 42, 38 8; (15), 35, 30 5, (17), 49 9, (19), 42, 42.6, (21), 41 5, 39.8, (23), 42.9, (25), 40, 45.5, (27), 41.5, 41.2, (29), 41.5, 39.6, (31), 36.1, (33), 46 0, 40.8, (35), 32, 35. /2/ Oxalated blood, Diphosphoglycerate P = (Total acid soluble P)-(P value after hydrolysis with N HCl at 100° C for 180 minutes) /3/ Heparinized blood, Rapoport method. /4/ Defibrinated blood, determined by Rapoport method.

82. BLOOD NUCLEOTIDE PHOSPHORUS[1]

Blood (B), R B C (C)

	Animal		Phosphorus mg/100 ml Value	Phosphorus mg/100 ml Range[c]		Animal		Phosphorus mg/100 ml Value	Phosphorus mg/100 ml Range[c]
	(A)		(B)	(C)		(A)		(B)	(C)
1	Man	B	2.8	2.2-3.4[c]	19	Pig	B	(4.5)	
2		C	(6.2)	(5.1-7.1)[c]	20		C	10.8	
3	Camel	B	1.4	1.1-1.7[c]	21	Rabbit	B	(3.2)	
4		C	5.7	4.9-7 6[c]	22		C	7.7	
5	Cat	B	(1.2)		23	Rat	B	(1.9)	
6		C	3.0		24		C	4.1	
7	Dog	B	(1.7)		25	Sheep	B	1.2	
8		C	3.8		26		C	3 8	
9	Goat	B	(1.1)		27	Chicken	B	(1.8)	
10		C	3 2		28		C	5.5	
11	Guinea pig	B	2.0		29	Duck	B	4.8	
12		C	5.5		30		C	14.0	
13	Horse	B	(0.5)		31	Goose	B	(6.2)	
14		C	1.5		32		C	14.0	
15	Monkey	B	1.2		33	Turkey	B	(3.7)	
16		C	3.7		34		C	9 9	
17	Ox	B	(0.8)		35	Turtle, sea	B	2.4	
18		C	2.0		36		C	8 8	

/1/ All determinations on defibrinated whole blood by the Kerr and Blish method, values for RBC content calculated on the basis of the whole blood content and the hematocrit values. Calculated values are in parentheses () The following figures represent, first, the item, next, the hematocrit, standard, (underscored), and/or the value reported by the investigator (not underscored). (1), 44.5, (3), 24.3, (5), 40, 28.4, (7), 45.5, 34.2, (9), 34.5, 28.3, (11), 42, 36.4, (13), 35, 41, (15), 42, 35.5, (17), 40, 38.8; (19), 41.5, 37.0, (21), 41.5, 41.6, (23), 46, 48.8, (25), 32, 31, (27), 32; (29), 39.5, 34.5, (31), 44, 48, (33), 38, 47, (35), 27 2.

83. BLOOD LIPID PHOSPHORUS

Blood (B); R B C (C); Plasma (P); Serum (S)

	Animal		Phosphorus mg/100 ml			Animal		Phosphorus mg/100 ml	
			Value	Range				Value	Range
	(A)		(B)	(C)		(A)		(B)	(C)
1	Man	B	11.2[1]		6	Dog	S	14.7[1]	
2									
3									
4									

/1/ Determined by Fiske-Subbarow method after treatment with Bloor's mixture. /2/ Determined by Bell and Doisy method after Bloor's mixture. /3/ 4.8 (2.8-6.7) by Tisdall method after extraction in alcohol, then chloroform.

84. BLOOD HEXOSE PHOSPHATE PHOSPHORUS[1]

Blood (B), R B C (C); Plasma (P)

	Animal		Phosphorus mg/100 ml			Animal		Phosphorus mg/100 ml	
			Value	Range				Value	Range
	(A)		(B)	(C)		(A)		(B)	(C)
1	Man	B	3.2	1.4- 5.0	3	Man	P	0.04	0.0-0.22
2		C	7.5	3.5-10.7					

/1/ Hexose phosphate P = (P value after hydrolysis in N HCl for 180 minutes at 100°C) - (P value after hydrolysis in N HCl for 7 minutes at 100°C).

85. BLOOD PHYTIC ACID PHOSPHORUS[1]

Blood (B); R B C (C)

	Animal		Phosphorus mg/100 ml			Animal		Phosphorus mg/100 ml	
			Value	Range				Value	Range
	(A)		(B)	(C)		(A)		(B)	(C)
1	Canary	B	26		8	Goose	C	71	
2		C	56		9	Pigeon	B	33	
3	Chicken	B	19.9		10		C	74	71-86
4		C	65	61-68	11	Turkey	B	(31)	
5	Duck	B	31		12		C	74	
6		C	69		13	Turtle, snapping	B	6.1	
7	Goose	B	(29)		14		C	25	

/1/ Found only in nucleated R B C. All determinations on heparinized whole blood by the Michel-Durand method as modified by Rapoport and Leva, values for R B C calculated on the basis of blood contents and hematocrit values. Parentheses ( ) enclose values calculated on basis of standard hematocrit values.

86. BLOOD SULFUR

Blood (B), R B C (C); Plasma (P), Serum (S)

	Constituent	Animal		Sulfur mg/100 ml Value	Sulfur mg/100 ml Range
	(A)	(B)		(C)	(D)
1	Sulfate S, total	Man	P	1.1	0.9-1.3
2		Rabbit	P	5.4	4.0-6.9
3	Non-protein S	Man	P	2.8	2.4-3.6
4		Rabbit	P	6.9	6.0-8.4
5	Inorganic S	Man	P	0.9	0.8-1.1
6		Cow	C	1.45	
7		Dog	C	1.35	
8		Dog	P	3.2	
9		Goat	C	1.5	
10		Horse	P	3.4	
11	Inorganic S	Rabbit	P	5.0	3.6-6.1
12		Rat	B	1.0	
13	Conjugated S[1]	Man	C	0.015	
14		Man	P	0.1	0-0.2
15		Cow	C	0.21	
16		Dog	C	0.54	
17		Goat	C	0.15	
18		Rabbit	P	0.4	0.1-1
19	Organic S	Man	P	1.7	1.4-2.6
20		Rabbit	P	1.6	1.0-2.1

/1/ Ethereal S.

87. BLOOD SULFUR COMPOUNDS

Blood (B), R B C (C), Plasma (P)

	Constituent	Animal		Sulfur Compounds per 100 ml Value mg	Sulfur Compounds per 100 ml Range mg
	(A)	(B)		(C)	(D)
1	Sulfate, total	Man	P	3.3	2.7-3.9
2		Rabbit	P	16.2	12-21
3	Sulfate, inorganic	Man	P	2 7	2.4-3.3
4		Dog	P	9.6	
5		Horse	P	10.2	
6		Rabbit	P	14.4	10.8-27
7		Rat	B	3.0	
8	Sulfate, conjugated[1]	Man	P	0.3	0-0.6
9		Rabbit	P	1.2	0.3-3.0
10	Cystine[2]				
11	Ergothioneine[3]	Man	B		1.9-5 5
12		Man	C	9.6	3 9-17.7
13		Man	P	0.0	
14		Pig	B	(8.4)	(6.3-9.8)
15		Pig	C	20.7	15.6-24
16		Pig	P	0 0	
17	Glutathione total	Man	B	(39)[6]	
18		Man	C	87	
19		Man	P	0.0	
20		Cow	B	46	
21		Cow	C	(181)	
22		Cow	P	0 0	
23	Glutathione reduced	Man	B	(35)	25-41
24		Man	C	79	
25		Man	P	0.0	
26		Cow	B	40	
27		Cow	C	(157)	
28		Cow	P	0.0	
29		Rat	B	40	30-45
30		Rat	C	(182)	(136-205)
31		Rat	P	0.0	
32	Glutathione oxidized	Man	B	(4)	
33		Man	C	8.5	
34		Man	P	0.0	
35		Cow	B	6	
36		Cow	C	(24)	
37		Cow	P	0.0	
38	Indican	Man	P		0.0-0.6
39	Insulin[4]				
40	Methionine[2]				
41	Thiamine[5]				
42	Thiocyanate	Man	B	0.77	0.5-1.4

/1/ Or ethereal sulfate /2/ See table on Free Amino Acid Content /3/ Or thioneine, present in R B C only. /4/ See table on Blood Hormone Content. /5/ See table on Blood Vitamin Content. /6/ Figures in parentheses were calculated on basis of standard hematocrit values, see table on Hematocrit Values.

88. BLOOD VITAMINS

	Constituent	Animal	100 ml Blood		100 ml R B C		100 ml Plasma[1]	
			Value	Range	Value	Range	Value	Range
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
1	Vitamin A as carotenol	Man	13 µg	9-17 µg	0[2]		24 µg	10-60 µg
2		Cow	14 µg	6-18 µg	0		24 µg	10-30 µg
3		Dog	1.5 µg	0-3 µg	0		3 µg	0-5 µg
4		Horse	8 µg	6-10 µg	0		12 µg	9-16 µg
5		Pig	12 µg	5-20 µg	0		20 µg	10-35 µg
6		Rabbit	25 µg	15-70 µg	0		45 µg	30-130 µg
7		Rat	6 µg	4-70 µg	0		10 µg	6-12 µg
8		Sheep	24 µg	14-31 µg	0		35 µg	20-45 µg
9		Chicken	31 µg	10-68 µg	0		45 µg	15-100 µg
10	Vitamin A as carotene	Man	120 µg	20-300 µg	0		220 µg	40-540 µg
11		Cow	40 µg	25-950 µg	0		70 µg	50-2000 µg
12		Horse	65 µg	13-114 µg	0		100 µg	20-175 µg
13		Pig	0		0			
14		Sheep	7 µg	0-14 µg	0		10 µg	0-20 µg
15		Chicken	24 µg	20-200 µg	0		50 µg	30-300 µg
16	Ascorbic[3] acid	Man	0.62 mg	0.2-0.7 mg	1.0 mg	0.5-2.8 mg	0.7 mg	0.1-2.5 mg
17		Cow	0.5 mg	0.2-1.5 mg			0.5 mg	0.2-1.5 mg
18		Horse	0.5 mg	0.2-1.5 mg			0.5 mg	0.2-1.5 mg
19		Pig	0.4 mg	0.2-1.2 mg			0.4 mg	0.2-1.2 mg
20		Dog	0.5 mg	0.2-2.1 mg			0.5 mg	0.2-2.1 mg
21		Rat	0.5 mg	0.1-1.5 mg			0.5 mg	0.05-1.5 mg
22		Sheep	0.5 mg	0.4-0.8 mg			0.5 mg	0.4-0.8 mg
23	Vitamin B_{12}[4]	Man	0.08 µg	0.06-0.14 µg				
24		Cow[5]	0.05 µg	0.04-0.05 µg				
25		Dog	0.09 µg	0.05-0.11 µg				
26		Goat	0.07 µg	0.06-0.09 µg				
27		Horse	0.21 µg	0.12-0.34 µg				
28		Mouse[6]	0.23 µg	0.22-0.23 µg				
29		Mouse[7]	0.12 µg	0.09-0.14 µg				
30		Pig	0.10 µg	0.08-0.13 µg				
31		Rabbit	1.01 µg	0.64-1.50 µg				
32		Rat, cotton	0.36 µg	0.33-0.38 µg				
33		Rat, white	0.08 µg	0.05-0.12 µg				
34		Sheep	0.07 µg	0.06-0.09 µg				
35		Chicken	0.56 µg	0.38-0.66 µg				
36		Turkey	0.53 µg	0.45-0.60 µg				
37		Turtle	0.66 µg	0.59-0.69 µg				
38	Biotin[3]	Man	1.23 µg	0.8-1.7 µg			1.3 µg	1.0-1.7 µg
39		Mouse	1.25 µg					
40		Rat		1.5-3.5 µg				
	Vitamin C, see Ascorbic acid							
	Carotene, -ol, see Vitamin A							
41	Choline[3], total	Man		11-31 mg			16.5 mg	26-35 mg
42		Cow						
43		Dog					15 mg	12-15 mg
44		Horse						
45		Mouse	18.5 mg					
46		Sheep					10 mg	8-15 mg

/1/ Or serum when specified /2/ Absence from R B C not conclusively established /3/ Determined by chemical methods. /4/ Oxalated blood, determined by the method of Skeggs et al, using Lactobacillus leichmanii as test organism /5/ In pasture fed cow, in dry lot fed calf, 0.09 (0.08-0.10) µg. /6/ American albino. /7/ Swiss albino

88. BLOOD VITAMINS (Continued)

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
47	Choline[1] free	Man	2.5 mg	1.0-4.0 mg		4.4-7.5 mg		0.05-2.5 mg
48		Cow					4 mg	
49		Dog						1.0-1.1 mg
50		Guinea pig						2-12 mg[2]
51		Horse					4 mg	
52		Pig					2.6 mg	
53		Rabbit					0.5 mg	
54		Rat						0.05-0.3 mg
55		Sheep					3 mg	1-4 mg
56	Vitamin D[3] as Calcif - erol (D_2)	Man					2.8 µg[2]	1.7-4.1 µg[2]
57		Cow			1.4 µg		6.8 µg	
58		Dog					1.4 µg[2]	
59		Pig					3.0 µg[2]	2.6-3.4 µg[2]
60		Rabbit					1.3 µg[2]	1.1-1.8 µg[2]
61		Sheep					1.3 µg[2]	1.1-1.8 µg[2]
62		Chicken					2.5 µg[2]	
63	Vitamin E[1] (Tocopherol)	Man					1.2 mg	0.9-1.9 mg
64		Cow					0.40 mg[2]	0.20-0.50 mg[2]
65		Dog					0.6 mg	
66		Pig					0.1 mg	0.09-0.15 mg
67		Rat						0.05-0.06 mg
68		Sheep					0.02 mg	0.01-0.03 mg
	Folic acid, see Pteroylglutamic acid							
69	Inositol[5]	Man					0.50 mg	0.37-0.76 mg
70		Mouse	6.6 mg					
	Vitamin K							
71	Nicotinic acid[6]	Man	0.6 mg[7,8]	0.2-0.9 mg[7,9]	1.3 mg[7,10]		0.075 mg[7]	0.025-0.15 mg[7]
72		Cow	0.3 mg[7]					
73		Dog	0.8 mg	0.5-1.3 mg[11]	1.6 mg			
74		Guinea pig		6.5-8.9 mg[12]				
75		Horse	0.6 mg[7,13]					
76		Ox	0.9 mg[7]					
77		Pig	0.5 mg[7]					
78		Rat	1.4 mg	1.2-1.8 mg				
79		Sheep	1.0 mg[7]	0.4-1.4 mg				
80		Chicken	1.1 mg[7]	1.0-1.2 mg[4]				
81	Pantothenic acid[6]	Man	30 µg	15-45 µg	25 µg	15-30 µg	15 µg	6-35 µg
82		Dog	25 µg	15-35 µg	25 µg	20-30 µg	30 µg	15-40 µg
83		Horse	45 µg	35-55 µg	52 µg	45-60 µg	38 µg	30-45 µg
84		Pig	35 µg	30-40 µg	30 µg	25-35 µg	35 µg	30-40 µg
85		Rabbit	20 µg	15-35 µg				20-30 µg
86		Sheep	35 µg	20-50 µg	30 µg	20-40 µg	25 µg	20-30 µg
87		Chicken	45 µg	40-50 µg				

/1/ Determined by chemical method. /2/ Content in serum. /3/ Determined by animal assay method. /4/ 6.5-10.5 mg coenzyme. /5/ Determined by microbiological method with Neurospora. /6/ Determined by microbiological method. /7/ Total nicotinic acid activity. /8/ 3.0 as coenzyme. /9/ 2.0-3.5 mg as coenzyme. /10/ 0.135 mg free nicotinic acid. 7.0 (6.5-9.0) mg as coenzyme. /11/ 5.1-6.6 mg as coenzyme. /12/ As coenzyme. /13/ 0.27 mg free nicotinic acid.

88. BLOOD VITAMINS (Concluded)

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
88	Para-amino benzoic Acid[1]	Man	3.4 µg					
89		Mouse	29 µg					
90	Pteroylglutamic acid[1], total[2]	Man	3.5 µg	2.3-53 µg			1.7 µg	1.5-5.0 µg
91		Cattle		2.1-3.0 µg				1.8-2.2 µg
92		Pig		2.3-3.1 µg				1.8-2.1 µg
93		Sheep	4.6 µg	3.5-5.5 µg				
94		Chicken		2.2-4.3 µg				3.0-4.2 µg
95	Pteroylglutamic acid[1], free	Man	0.085 µg	0.05-0.13 µg			0 05 µg	
96		Cattle	0.19 µg	0.06-0.45 µg			0.05 µg	
97		Horse	0.33 µg	0.22-0.6 µg			0 35 µg	0.25-0.48 µg
98		Pig	0.66 µg	0.45-0.99 µg			0 61 µg	0.48-0.87 µg
99		Chicken	0.87 µg	0.44-1.65 µg			0 31 µg	0.14-0.42 µg
100		Turkey	1.68 µg	1.02-2.76 µg			0.6 µg	0.25-1.08 µg
101	Pyridoxine	Monkey	11 µg	5-20 µg	5 µg	2-21 µg	8 µg	1-18 µg
102		Mouse	42 µg					
103		Sheep	12 µg					
104	Riboflavin	Man		15-60 µg[1]	22.4 µg[3]	18-26 µg[3]	3.2 µg[3]	2.6-3.7 µg[3]
105		Dog	97 µg[1]	90-100 µg[1]				
106		Cow, young	45 µg[1]	40-50 µg[1]				
107		Pig	95 µg[1]					
108		Rat	45 µg[1]	20-65 µg[1,5]		100-130 µg[1,4]		
109		Sheep	27 µg[1]	24-30 µg[1]				
110		Chicken	15 µg[6]	12-18 µg[6]			34 µg[6]	33-35 µg[6]
111		Snake		0-310 µg[1]				
112	Thiamine[1]	Man ♂	8.9 µg[12]	6.1-10.7 µg[1,6]	10 µg[1]	7-14 µg[12]		
113		Man ♀	7.6 µg[12]	6.2-9.0 µg[8,12]	6.5 µg[1]	5-8 µg[12]		
114		Man	8.0 µg[8]	4-11 µg[8]	8 0 µg[8]	7-10 µg[8]	7 µg[8]	1-9 µg[8]
115		Cow	8 µg[8,9]	5-11 µg[8,10]				
116		Dog	7.0 µg	5-9 µg[8]			2.10 µg[8]	0.1-4.0 µg[8]
117		Guinea pig		45-80 µg[12]				
118		Horse		1 1-1.7 µg[12]				
119		Ox		4.5-5.1 µg[12]				
120		Pig	20 µg[8]	17-30 µg[8,11]				
121		Rabbit		3-30 µg[8]				
122		Rat	20.5 µg[12]	10-25 µg[12]				
123		Sheep	9.8 µg[8]	3-15 µg[7,8]			3.8 µg[8]	
124		Chicken	6.0 µg[12]	5.6-11 µg[12]				
125		Pigeon	29 µg[8]	21-40 µg[8]				14-22 µg[8]
126		Frog	9 0 µg[12]					
127		Snake			(80 µg)[13]			
	Tocopherol, see Vitamin E							

/1/ Determined by microbiological method. /2/ Takadiastase treated samples /3/ Determined by Burch-Bessey-Lowry fluorometric method /4/ As coenzyme. /5/ 50-65 µg coenzyme /6/ Determined by fluorometric method. /7/ 4-4.7 µg thiamin pyrophosphate /8/ Total thiamin /9/ 0.5 µg free thiamin. /10/ 0-0 1 µg free thiamin. /11/ 12-20 µg thiamin pyrophosphate /12/ As thiamin pyrophosphate. /13/ In 1 g R B C.

89. BLOOD HORMONES

	Constituent	Animal	100ml Blood (B), Plasma (P), R B C (C)		
				Value	Range
	(A)	(B)		(C)	(D)
1	Adrenocorticotrophic H.[1]	Man	B	<15 µg[2]	
2		Rat	B	<15 µg[2]	
3	Androgen[3] as Testosterone[4]	Man	P	2.8 mg	2.2-3.4 mg
4		Woman	P	2.8 mg	2.1-3.2 mg
5	Chorionic Gonadotrophic H.[5]	Woman, pregnant	P	14000 iu	7000-60000 iu
6		Woman, pregnant[6]	P		400-1000 iu
7	Corticosteroids[7,41]	Man	P	0.23 mg	0.11-0.42 mg
8		Woman	P	0.28 mg	0.13-0.42 mg
9		Dog, male	P	0.27 mg[37]	0.12-0.38 mg
10		Dog, female	P	0.22 mg[37]	0.12-0.38 mg
11		Rat	B	0.33 mg[38]	
12	Epinephrin[8]	Man	B	+	
13		Cat	B		
14		Rabbit	B	8.4 µg	1.6-3.1 µg
15	Estrogen[3] as Estradiol	Woman, pregnant[9]	B	0.22 µg[11,12]	
16		Woman, pregnant[10]	B	0.55 µg[11,12,40]	
17		Cow	B	0.3 µg[12,14]	
18		Cow	P	0.25 µg[11,12]	
19		Cow, pregnant[13]	B	0.38 µg[12,14,15]	
20		Cow, pregnant[13]	C	0.2 µg[11,12]	
21		Cow, pregnant[13]	P	0.1 µg[11,12]	
22	Follicle Stim. H.[16]	Woman, pregnant	P	+	
23	Gonadotrophins[17]	Woman[18]	P	+	
24	Growth H	Man, ♂♀	P	+	
25	Insulin	Man, after eating	B	0.8 µg	
26		Dog, Rabbit, fasted	B		
27	Intermedin	Man	P	+	0.35-0.45 µg
28	Lactogenic H.[19]	Woman, postpartum	P	+	
29		Mare, pregnant	P	2 ru[39]	
30	Luteinizing H.[20]	Woman, pregnant	P	+	
31	Nor-epinephrin[21]	Man, Cow	B		
32	Parathormone	Man, Dog	P	+	2-4 µg
33	Pitocin[22]	Man	B	1 u[22]	
34	Pitressin[23]	Man	B	0.01 u[24]	
35	"Pregnant Mare's Serum"[25]	Mare, pregnant	P		4300-35200 iu
36	Progesterone	Woman, pregnant[26]	P	530 µg[27]	
37		Woman, luteal phase	P		30-700 µg[27,28]
38		Monkey, luteal phase	P	600 µg[27]	20-520 µg[27,29]
39		Rabbit, pseudo-preg	P	600 µg[27]	
40		Mouse, pregnant	P		
41		Rooster	P	300 µg[27]	500-1000 µg[27,30]
42		Hen, ovulating	P	300 µg[27]	
43	Relaxin	Woman, pregnant	P	+	
44		Rabbit, pregnant	P	1000 GPU[31]	
45		Guinea pig, preg.	P	50 GPU[31]	
46		Sow, pregnant	P	200 GPU[31]	
47	Thyroid H.[32]	Man, adult	P	5 µg	4-8 µg
48		Man, 3-13 yr.	P	5.5 µg	4-7 µg
49		Dog	P	2.3 µg	2-4 µg
50		Rat	P	3.2 µg	3-4 µg
51		Mouse	P		3-4 µg
52		Guinea pig	P		2-2.5 µg
53		Horse	P		2.4-4.8 µg
54		Monkey	P		4-8 µg
55		Chicken	P		3-4 µg
56	Thyrotrophic H.[33]	Man	B	0.09 JSU[34]	0.05-0.15 JSU[34]
57		Man	B		3900-4900 CC[35]
58	Acetylcholine[36]	Lamb, Pigeon	P	0.09 JSU[34]	
59		Man	P		6.6-8.2 µg

/1/ "ACTH." /2/ By adrenal ascorbic acid depletion. /3/ Reliable values not available for androsterone, estriol and estrone, as such. /4/ By chromatographic determination of the phenylhydrazone derivatives. Biological assay needed. /5/ "Anterior Pituitary-Like", = "APL"; one iu specific gonadotrophic activity of 100 µg pregnant urine preparation kept at NIMR, London. /6/ 140 days, to term; peak at 60-90 days. /7/ Also in blood of cat, rabbit, goat, pig, except as specified, expressed as desoxycorticosterone (11 as DCA) determined by reducing power of extracts. /8/ See also 31. In suprarenal vein blood, trace demonstrable in general circulation. /9/ 3 months. /10/ 5.5 months. /11/ By dialysis. /12/ Modified Astwood assay. /13/ 6 months. /14/ By acetone precipitation. /15/ 0.23 µg protein-bound. /16/ "FSH." /17/ = 22, 28, 30. /18/ 9-13 days of cycle, also castrate, menopause. /19/ "Luteotrophin", "prolactin", "LT." /20/ "LH." /21/ Demethylated epinephrin, as dl-nor-epinephrin; in cat suprarenal vein blood 6.6-26 µg per 100 ml. /22/ "Oxytocin"; one unit equivalent to 0.5 mg postpituitary powder (USP XII). /23/ "Vasopressin." /24/ Antidiuretic units. /25/ "PMS." /26/ 8 weeks. /27/ Intrauterine assay on mice. /28/ Free. Protein-bound = 20-80 µg. /29/ Free. Protein-bound = 10-50 µg. /30/ Free progesterone, 30-850 µg; bound, 30-70 µg. /31/ Guinea pig units. /32/ As protein-bound iodine. /33/ "TSH." Also reported in dog, rabbit, rat. Not detected in plasma of cow, horse, guinea pig, pigeon and turtle according to Paschkis. /34/ Junkmann-Schoeller units; 56 + 58 C determined by tadpole stasis method of D'Angelo and Gordon. /35/ Cytological coefficient. /36/ A neurohumor. /37/ Dog blood has 1.2 mg; determined by mouse liver glycogen method of Venning. /38/ 0.35-0.42 mg in blood of male rat; 0.22-0.30 mg in female. /39/ Riddle units. /40/ 0.03-0.06 µg in 100 ml blood in non-pregnant woman. /41/ L. T. Samuels reports values 0.01 x these values, by new method.

90. BLOOD ENZYME ACTIVITY

Blood (B), R B C (C); Plasma (P), Serum (S)

	Variable	Animal		Enzyme Activity per 100 ml	
				Value	Range
	(A)	(B)		(C)	(D)
1	Adenosine deaminase	Rabbit	B	415[1]	
2	Adenosine polyphosphatase, acid	Man	S	41[2]	21-61[b]
3	Adenosine polyphosphatase, alkaline	Man	S	30[2]	10-51[b]
4	Adenylic acid deaminase, muscle	Rabbit	B	41[3]	
5	Aldolase	Man	S	490[4]	350-800[d]
6			C	+	
7		Rat, albino	C	90,000[4]	70,000-110,000[d]
8			S	6,000[4]	4,000-9,000[d]
9	Amylase	Man	S		80-150[5]
10	Arginase	Man	C	♂5,100[6]	2,500-7,700[b]
11			C	♀4,400[6]	1,800-7,000[b]
12			B	♂♀2,000[6]	800-3,200[b]
13		Monkey	P	0	
14		Mouse	P	0	
15			C	0	
16		Rat	P	+	
17			C	0	
18	Carbonic anhydrase	Man	C	73,000[7]	
19		Cat	C	128,000[7]	
20	Carbonic anhydrase (continued)	Cattle	C		80,000-140,000[7]
21		Calf	C	44,000[7]	
22		Dog	C	84,000[7]	
23		Guinea pig	C	60,000[7]	
24		Pig	C	59,000[7]	
25		Rat	C	144,000[7]	
26		Chicken	C	22,000[7]	
27	Catalase	Man	C	0.1[8]	
28			S	690[9]	420-950
29		Cow	B	202,800[10]	81,600-469,200
30	Cholinesterase (substrate = acetylcholine)	Man	B	336[11]	273-407[11]
31			C	547[11]	437-660[11]
32			P	176[11]	139-219[11]
33			S		135-362[12]
34		Cat	S		92-140[12]
35		Dog	S		112-303[12]
36		Guinea pig	S		125-230[12]
37		Horse	S		248-310[12]
38		Mouse	S		430-685[12]
39		Ox	S		
40		Pig	S	45[12]	
41		Rabbit	S	40[12]	
42		Rat	C	253[13]	18-35[12]
43		Sheep	S	0[12]	
44		Chicken	S		28-78[12]

/1/ µg N liberated/hr. /2/ µM P from ATP/hr at pH 4 8 for acid adenosine polyhosphatase, and at pH 8.9 for alkaline adenosine polyphosphatase. Corrected for inorganic P and non-enzymatic hydrolysis. /3/ µg N liberated/hr in presence of 0.05% adenylic acid. /4/ µl fructose diphosphate/hr at 38°C at pH 8.6. No change in pregnancy. /5/ mg dextrose or equivalent (by copper reduction) from starch under specified conditions. /6/ Units as described by Kochakian. Fall in malnutrition. /7/ Amount of R B C that will halve the time of uncatalyzed reaction at 30°C under specified conditions. Fall in newborn, parallels R B C Zn concentration in all conditions in adults. /8/ g/100g dry weight. /9/ Units described by Dille et al. /10/ mg H_2O_2 split/10 min under conditions specified. /11/ µM acetylcholine hydrolyzed/min as measured by ml 0.01N NaOH required to neutralize acetic acid formed/min from 0.0025M acetylcholine at pH 7.65 at 25°C. /12/ µM acetylcholine hydrolyzed/min from 0.01M acetylcholine. /13/ µM acetylcholine hydrolyzed per min from 0.015M acetylcholine.

90. BLOOD ENZYME ACTIVITY (Continued)

Blood (B); R B C (C); Plasma (P); Serum (S)

	Variable	Animal		Enzyme Activity per 100 ml Value	Enzyme Activity per 100 ml Range
	(A)	(B)		(C)	(D)
45		Man	C	261	
46			P	5.8	
47		Cat	C	12.1	
48			P	16.2	
49		Cow	C	211	
50			P	Trace	
51		Dog	C	61	
52			P	14.8	
53		Guinea pig	C	153	
54			P	16.6	
55	Cholinesterase[14,16,17] (substrate = acetylbeta-methylcholine)	Horse	C	81	
56			P	8.1	
57		Rabbit	C	34	
58			P	25.2	
59		Rat	C	+	
60			P	16.2	
61		Sheep	C	76	
62			P	13.0	
63		Fowl	C	Trace	
64			P	72	
65		Labrus (bony fish)	C	0	
66			P	0.3	
67		Scyllium (elasmo-branch)	C	0	
68			P	7.6	

	Variable	Animal		Enzyme Activity per 100 ml Value	Enzyme Activity per 100 ml Range
	(A)	(B)		(C)	(D)
69		Man	C	Trace	
70			P	110	
71		Cat	C	0	
72			P	45	
73		Cow	C	Trace	
74			P	Trace	
75		Dog	C	0	
76			P	144	
77		Guinea pig	C	Trace	
78			P	60	
79	Cholinesterase[15,16] (substrate = benzoylcholine)	Horse	C	Trace	
80			P	243	
81		Rabbit	C	0	
82			P	19.8	
83		Rat	C	0	
84			P	5.8	
85		Sheep	C	0	
86			P	0	
87		Fowl	C	Trace	
88			P	4.5	
89		Labrus (bony fish)	C	Trace	
90			P	Trace	
91		Scyllium (elasmo-branch)	C	0	
92			P	Trace	

/14/ µM acetyl-beta-methylcholine hydrolyzed/min as measured by volume CO_2 evolved/min from 0.03M acetyl-beta-methylcholine. /15/ µM benzoylcholine hydrolyzed/min as measured by volume CO_2 evolved/min from 0.006M benzoylcholine. /16/ Where figures in literature reported in terms of whole blood, hematocrit values of 45 assumed in present conversion. /17/ R B C cholinesterase activity high in reticulocytes and young cells; high in conditions accompanied by hyperactive hematopoiesis.

90. BLOOD ENZYME ACTIVITY (Concluded)

Blood (B), R B C (C), Plasma (P), Serum (S)

	Variable (A)	Animal (B)		Enzyme Activity per 100 ml: Value (C)	Enzyme Activity per 100 ml: Range (D)
93	Dehydropeptidase	Man	S	359[18]	191-527
94	Glucose-6-phosphate dehydrogenase	Rat	C	+	
95	beta-Glucuronidase	Man	S		♂ 0-181[19]
96			S		♀ 37-230[19]
97	Glyoxalase	Man	C	1,398,000[20]	320,000-1,500,000[20]
98			B	611,700[20]	425,000-705,000[20]
99		Rat	C	2,040,000[20]	
100			B	861,000[20]	
101	Hexokinase	Rat	C	+	
102	Histaminase	Man	B	36[21]	30-40
103			S	18[21]	0-36
104	Lactic dehydrogenase	Man	S	+	
105			C	+	
106	Lipase	Man	S		0-150[22]
107	Methemoglobin reductase	Rabbit	C	+	
108	Phenolsulphatase	Man	S		30-1,550[23]
109	Phosphatase, acid	Man	S		1.0-4.0[24]
110	Phosphatase, alkaline[27]	Man, adult	S		10.5-13.0[25]
111		Man, adult	S		1.0-4.0[26]
112		Man, child	S		5.0-14.0[28]
113	Profibrinolysin	Man	P		50-125[29]
114	Vitamin B_c conjugase	Man	P		80-100[30]

/18/ μM NH_3/30 min from DL-alanyldehydroalanine at 37°C at pH 8.1. /19/ μg phenolphthalein/hr from phenolphthalein-glucuronide at 38°C at pH 4.5. Rise in pregnancy from 300 μg at 3 mos. to 1350 μg at term. /20/ μl CO_2/20 min from methylglyoxal at pH 7.2 at 26°C in presence of glutathione. /21/ μg histamine destroyed in 90 min at 37°C. Rise in pregnancy. /22/ ml N/20 NaOH/24 hr from standard olive oil emulsion. /23/ Amount of enzyme which produces color equivalent to 10 μg of p-nitrophenol from p-nitrophenyl sulphate. /24/ mg phenol/hr from disodiumphenylphosphate at 37°C at pH 5.0. /25/ mg phenol/30 min from disodiumphenylphosphate at 37.5°C at pH 9.0. /26/ mg P/hr from beta-glycerophosphate at 37°C at pH 8.6. /27/ Rise in osteoblastic activity and pregnancy. /28/ mg P/hr from beta-glycerophosphate at 37°C at pH 8.6. /29/ Units of fibrinolysin. A unit will completely lyse a 0.1% fibrin clot in 120 seconds at 28°C at pH 7.2 in isotonic saline buffered with imidazole. /30/ μg folic acid/90 min from yeast extract at 37°C at pH 4.5.

91. BLOOD COENZYMES

Blood (B); R B C (C); Plasma (P)

	Variable	Animal		µg/100 ml		Method
				Value	Range	
	(A)	(B)		(C)	(D)	(E)
1	Coenzyme A (as bound pantothenic acid)	Man	C		210-280[c]	Acetylation of sulfanilamide
2	Cocarboxylase (as bound thiamine)	Man[1]	B	7.0	2.8-11.2[b]	Manometric determination of CO_2 evolved from pyruvate
3		Ox[1]	B	5.7	2.7-8.7[b]	
4		Pigeon[1]	B	20.2	0.6-40[b]	
5		Man ♂	B	8.9		Microbiological assay
6			C	10.0[2]	7.0-14.0[c]	
7		Man ♀	B	7.6		
8			C	6.5[2]	5.0-8.0[c]	
9		Cattle, young	B		7.9-10.1[c]	
10		Guinea pig	B		45-80[c]	
11		Horse	B		1.1-1.7[c]	
12		Ox	B		4.5-5.1[c]	
13		Rat, albino	B	20.5	10-25[c]	
14		Sheep	B		4.0-4.7[c]	
15		Swine	B		12-20[c]	
16		Chicken	B	6.0	5.6-11.0[c]	
17		Frog	B	9.0		
18	Flavine adenine dinucleotide	Man	C	75		Modification of alanine test of Warburg & Christian
19			P	10		
20		Rat, albino	B		50-65[c]	Microbiological assay
21	Pyridine nucleotide, total (as DPN)[3]	Man	B	3600	2600-4600[b]	Alkaline acetone method
22			C	7700	6100-9300[b]	
23			P	70	20-120[c]	

/1/ All blood cocarboxylase is intracellular. /2/ Sex difference in R B C cocarboxylase values is significant, males have 1.49µg/100 billion R B C; females have 1.28 µg/100 billion R B C. /3/ Ratio of DPN/TPN in R B C is estimated to be about 8/1, DPN is present almost entirely in R B C.

92. BLOOD ELECTROLYTES

Blood (B); R B C., (C), Plasma (P); Serum (S); Celomic Fluid (F)

	Constituent (A)	Animal (B)		Electrolytes mEq per 1000 ml[1] Value (C)	Electrolytes mEq per 1000 ml[1] Range (D)
1		Man	B	83	72-91
2		Man	C	18.6[2,3]	8.7-28.6[b,2,3]
3		Man	S	138[2,3]	132-144[b,2,3]
4		Cat	S	151[2,3]	147-156[b,2,3]
5		Dog	B	(127)	(116-136)
6		Dog	C	97[3]	90-104[b,3]
7		Dog	P	150[3]	135-160[3]
8		Dog	S	143[3]	137-149[b,3]
9	Sodium	Monkey	B	99[3]	86-109[3]
10		Monkey	C	18[3]	12.5-27[3]
11		Monkey	P	152[3]	138-177[3]
12		Rabbit	P	136[4]	
13		Rabbit	S	141	
14		Rat	S	134	133-135
15		Chicken	B	(109)	(98-126)
16		Chicken	C	18[3]	12.3-27[3]
17		Chicken	P	154[3]	140-175[3]
18		Man	B	48	39-62
19		Man	C	95[3]	89-101[b,3]
20		Man	S	4.2[3]	3.6-4.8[b,3]
21		Cat	S	4.3	4.0-4.5[b]
22		Dog	B	(6.0)	(4.9-9.6)
23		Dog	C	8.0	4.2-11.8
24		Dog	P	4.4	3.7-5.8
25		Guinea pig	S	6.5	
26	Potassium	Monkey	B	53	46-62
27		Monkey	C	113	96-131
28		Monkey	P	6.8	4.9-8.7
29		Rabbit	P	5.1[5]	
30		Rat	P	5.9[5]	5.4-6.4[b,5]
31		Rat	S	5.1	4.8-5.4[b]
32		Canary	S	5.8	
33		Chicken	B	(43)	(37-50)
34		Chicken	C	119	106-143
35		Chicken	P	6.0	4.6-6.5
36	Potassium	Duck	S	4.8	
37		Toad	S	3.9	
38		Man	C		0.6-1.4
39		Man	P	4.8	4.3-5.2
40		Man	S	5.2	4.0-5.5
41		Dog	P	5.3	4.7-6.1
42		Dog	S	4.9	4.2-5.6
43	Calcium[6]	Guinea pig	P	5.3	3.7-6.8
44		Guinea pig	S	4.8	4.4-6.2
45		Rabbit	P	7.2	
46		Rat	P	6.2	5.4-7.2[b]
47		Rat	S	6.1	5.8-6.3
48		Chicken	S	5.6	4.8-6.3
49		Pigeon	P	5.3	
50		Man	B	(3.2)	(3.0-3.7)
51		Man	C	5.1	1.6-6.7
52		Man	P	1.8	1.7-1.9
53		Cat	B	3.1	
54		Cat	C	4.4	
55		Cat	S	2.2	
56		Cattle	B	1.7	1.6-1.8
57		Cattle	C	1.2	0.4-2.4
58		Cattle	S	2.3	1.0-2.9
59	Magnesium	Dog	B	(2.7)	
60		Dog	C	3.7	
61		Dog	P	1.8[7]	1.3-2.0[7]
62		Dog	S	1.9	1.4-2.4[b]
63		Guinea pig	B	(5.6)	
64		Guinea pig	C	8.1	
65		Guinea pig	S	4.0	
66		Hamster	C	8.3	
67		Hamster	P	2.1	
68		Hedgehog	P	2.7	
69		Horse	B	(3.6)	

Values in parentheses ( ) were calculated from contents in blood cells and plasma on basis of hematocrit values. /1/ To convert mEq/1000 ml to mg/100 ml, multiply mEq values by 2.3 for sodium, 3.9 for potassium, 2.0 for calcium, 1.2 for magnesium, 3.5 for chloride, 2.3 for bicarbonate, 1.8 for phosphate, 1.6 for sulfate. /2/ Determined by chemical method. /3/ Determined by flame photometry. /4/ Determined by zinc uranyl acetate (Butler and Tuthill) method /5/ Determined by colorimetric method of Shohl and Bennett /6/ Determined by Tisdall method or modification. /7/ Calculated from value of phosphate determined by method in footnote 12, after precipitation of magnesium as magnesium ammonium phosphate as described by Hald.

92. BLOOD ELECTROLYTES (Concluded)

Blood (B); R B C (C); Plasma (P); Serum (S); Celomic Fluid (F)

	Constituent (A)	Animal (B)		Electrolytes mEq per 1000 ml[1] Value (C)	Electrolytes mEq per 1000 ml[1] Range (D)
70	Magnesium	Horse	C	5.6	4.0-7.2
71		Horse	P	2.0	
72		Horse	S	2 2	1.6-2 5
73		Mouse	C	9.8	
74		Mouse	S	6.3	
75		Pig	B	4.4	4.2-4.7
76		Pig	C	8.4	6.8-9.2
77		Pig	S	2.2	1.9-3.2
78		Rabbit	B	4.4	3.9-4.5
79		Rabbit	C	6.0	5.3-11.2
80		Rabbit	P	2.0	1.7-2.5
81		Rat	B	(4.8)	(3.7-5.8)
82		Rat	C	7.1	5 8-8 4
83		Rat	P	2.9	2.0-3.7[b]
84		Rat	S	2.6	2.4-2.8[b]
85		Sheep	B	2.3	2.2-2.4
86		Sheep	C	2.0	0.9-2.6
87		Sheep	P	1 9	1.7-2.1
88		Chicken	B	(4 0)	
89		Chicken	C	7.7	
90		Chicken	P	2.3	
91		Pigeon	B	(17)	
92		Pigeon	C	36	
93		Pigeon	P	2.0	
94		Turtle	B	(6.6)	
95		Turtle	C	20.1	
96		Turtle	P	2.8	
97		Frog	B	(5 6)	
98		Frog	C	13.2	
99		Frog	P	2.3	
100		Frog	S	1.8	
101		Salmon	S	3.4	1.7-5.1
102		Spheroides asculatus	S	9.1	
103		Lepidosteus osseous	S	0.6	
104		Crustacea: Maja verrucosa	B	113	
105		Homarus vulgarus	B	8.3	
106		Mollusks: Doris tuberculata	B	116	
107		Arthropoda: Honeybee larva	B	17.5	
108		Limulus	B	99	
109		Echinodermata. Echinus esculentus	F	101	
110	Chloride	Man	B	82	71-87
111		Man ♂	C	52	
112		Man ♀	C	55	
113		Man ♂	S	101	97-105[b]
114		Man ♀	S	103	99-108[b]
115		Dog	B	(87)	(82-91)
116		Dog	C	65	61-69[b]
117		Dog	P	106[8]	99-110[8]
118		Monkey	B	93	83-110
119		Monkey	C	67	56-73
120		Monkey	P	110	103-118
121		Rabbit	P	105[9]	92-112[9]
122		Rabbit	S	100	
123		Chicken	P	122	116-140
124	Bicarbonate	Man ♂	S	28[10]	25-31[10]
125		Man ♀	S	26[10]	24-29[10]
126		Dog	P	20.5[10]	18.0-24.0[10]
127		Rabbit	S	28	
128		Rat	P	22.4[11]	
129		Rat	S	20.9	16.1-25.3[b]
130	Phosphate	Man	S	2.1	1.7-2.7
131		Dog	P	1.6	1.3-2.0
132		Rabbit	P	2.8	
133		Rat	P	7.0	5.8-8.2
134	Sulfate	Man	P		1.0-1.5
135		Dog	P	2.0	
136	Protein	Dog	P	14.5	12.0-19.0
137	Lactate	Dog	P	2.6	1.9-3.6
138	Pyruvate	Dog	P	0.12	0.1-0.2

/8/ Determined by absorption indicator method of Saifer and Kornblum and checked by method of Van Slyke and Sendroy. /9/ Determined by mercurimetric method of Schales and Schales. /10/ Determined by method of Van Slyke and Neill. /11/ Determined by micro-diffusion method.

93. BLOOD MINOR MINERALS

Blood (B), R B C (C), Plasma (P), Serum (S); Leukocytes (L)

	Constituent	Animal		μg/100 ml Value	μg/100 ml Range
	(A)	(B)		(C)	(D)
1	Aluminum[1]	Man	B	15	-40
2		Man	C	7	-17
3		Man	P	46	-88
4	Bromine[2]	Man	S		0.7-1.0
5	Copper	Man	B	94[3]	73-115[3]
6		Man	C	75[3]	49-101[3]
7		Man	P	110[3]	76-143[3]
8		Cow	B		820-1400
9		Ewe	B		730-1450
10		Hen	S	14	
11		Horse	B	36	34-37
12		Horse	S	38	31-41
13		Ox	S	34	33-35
14		Pig	P	206	153-259[3]
15		Rabbit	B	85	74-99
16		Rabbit	C	67	51-86
17		Rat	S	320	
18	Fluorine	Man	B	(28)	(11-45)
19		Man	C	27	11-44
20		Man	P	28	10-45
21		Dog	C	17[4]	9-24[4]
22		Dog	P	25[4]	12-35[4]
23	Iodine, total	Man	B	7.7[5]	3-13[5]
24		Man	S	7.1	4.8-8.6
25		Chicken	P	7.2	
26		Dog	S	29	14-52
27		Guinea pig	B	7.3	
28		Mouse	P	4.5	
29		Rat	P	3.4	3.3-3.5
30	Iodine, precipitable	Man	S	5.0	3.8-7.1
31		Rat	S	2.2	1.5-3.4
32	Iron[6]	Man	B	(48)	(43-52)
33		Man	P	105	32-177
34		Pig	P	169	91-247
35		Rat	P	261[3]	
36	Lead[1]	Man	B	29	18-49
37		Man	C	57	29-86
38		Man	P	2.9	-7.8
39		Rabbit	B	39	
40		Rabbit	P	15	
41	Manganese[1]	Man	B	13	0-25
42		Man	C	19	-48
43		Man	P	8	-19
44		Rat	B	17	
45	Silicon[7]	Man	B	50	33-63
46		Dog	B	23	
47		Horse	B	129[8]	
48		Horse	S	118[8]	
49		Rabbit	B	100	
50		Rabbit	P	18	
51	Silver[1]	Man	B,C	+	
52	Tin[1]	Man	B	22	-40
53		Man	C	26	-64
54		Man	P	4	-10
55	Zinc[9]	Man	B	880	488-1272
56		Man	C	1440	911-1969
57		Man	P	300	0-613
58		Man	L	3.2μg/100 million cells	

/1/ Determined by spectrochemical methods after ashing These values relative to volume, derived from gravimetric methods on basis of assumed blood specific gravity of 1 056 /2/ Gold chloride added to filtrate. /3/ Determined by unpublished method of Gubler, Lahey, Ashenbrucker, Wintrobe, and Cartwright. /4/ Micrograms per 100 g. /5/ After alkaline ashing /6/ Determined by methods of Kitzes, Elvehjem, and Schutte, and of Barkan and Walker. /7/ Heparinized blood stored in cellophane tube, unless specified otherwise /8/ Defibrinated blood /9/ Determined by modified dithizone method.

94 BLOOD GASES MAN[1]

	Variable			Whole Blood: ml Gas in 100 ml Whole Blood	Whole Blood: ml Gas in ♂ 45 0 ml[2] ♀ 40 0 ml[2,3] R B C	Whole Blood: ml Gas in ♂ 55 0 ml[2] ♀ 60 0 ml[2,3] Plasma	ml Gas in 100 ml R B C (in contact)[4]	ml Gas in 100 ml Plasma (in contact)[4]	Blood Gas Pressure (Tension) mm Hg	Factors and Constants	
	(A)			(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
1	Oxygen Capacity[5]		M	20 4[6]			♂45.3[8]				
2			F	18 0[6,7]			♀45 3[9]				A-VO_2 Diff
3	Total Oxygen	Arterial	M	20 3[10,11]	20 1	0 142	44 7	0.258	94		5 00
4			F	17 9	17 7	0 155	44 7	0 258	94[9]		4 20
5		Venous[12]	M	15.3	15 2	0.060	33 9	0 110	40[13]		
6			F	13 7	13 6	0 068	34 4	0.113	41[13]	a_{O_2} Cells[14]	a_{O_2} Plasma[14]
7	"Free" Oxygen	Arterial	M	0 285[10]	0 144	0 142	0 319	0 258	94		
8			F	0 282	0 126	0 156	0.319	0 258	94[9]	0.0258[14]	0 02089[14]
9		Venous[12]	M	0.122	0 061	0 061	0.136	0.110	40[13]		
10			F	0 124	0 055	0 068	0 139	0 113	41[13]	HbO_2 Sat %	
11	Combined Oxygen (HbO_2)	Arterial	M	20 0	20 0	0	44 4	0	94	98	
12			F	17 6	17 6	0	44 4	0	94[9]	98	
13		Venous[12]	M	15.2	15 2	0	33 6	0	40[13]	73 5	
14			F	13 6	13.6	0	34 3	0	41[13]	74.5	
										r[15]	A-V CO_2 Diff[16]
15	Total Carbon Dioxide	Arterial	M	49 0	16.2	32.8	36 0	59 6[15]	41	1 217	4 1
16			F	48 0[17]	13 6	34.4	34 3	57.0[17]	39[18,19]	1 187	3 4
17		Venous[12]	M	53 1	18 0	35 1	40 1	63 8	46 5[19]	1.201	
18			F	51.4	14 9	36 5	37 7	60 4[17]	43[19]	1.175	
										a_{CO_2} Cells	a_{CO_2} Plasma
19	"Free" Carbon Dioxide	Arterial	M	2 624	1 060	1 564	2 356	2 844	41		
20			F	2 532	0 891	1 641	2 250	2 717	39[18,19]	0 4399[20]	0 5311[20]
21		Venous[12]	M	2 997	1 211	1 786	2 690	3 248	46 5[19]		
22			F	2.785	0 965	1 820	2 437	3 013	43[19]	pH Cells	pH Plasma
23	Total Combined Carbon Dioxide	Arterial	M	46.4	15 1	31 2	33 6	56 8	41	7.19	7.40
24			F	45 5	12 7	32 8	32 1	54 3	39	7.20	7.40[9]
25		Venous[12]	M	50 1	16 8	33.3	37 4	60 5[10]	46.5	7.17	7 37[21]
26			F	48 6	14 0	34 7	35.3	57 4	43	7.18	7.38[19]
										"c" Cells[22]	"c" Plasma[22]
27	Carbamino Carbon Dioxide	Arterial	M	2 2[10]	1 7	0 4	3.9	0 8	41	0.115	0 014
28			F	1 9[10]	1 5	0 5	3 7	0.8	39	0 116	0 014
29		Venous[12]	M	3 1	2 6	0 5	5 8	0 8	46 5	0 154	0.014
30			F	2 7	2 2	0 5	5 5	0 8	43	0 156	0 014
31	Bicarbonate Carbon Dioxide	Arterial	M	44 2	13 4	30 8	29 8	56.0	41		
32			F	43 6	11 2	32 3	28 3	53 5	39		
33		Venous[12]	M	47 0	14 2	32 8	31 6	59 7	46.5		
34			F	46 0	11 8	34 2	29 8	56 6	43	a_{N_2} Cells	a_{N_2} Plasma
35	Nitrogen	Arterial	M	0 979	0 494	0 484	1 099	0 881	572[23]		
36			F	0 970	0 437	0 534	1.103	0 884	574[23]	0 0146[24]	0 0117[24]
37		Venous[12]	M	0 979	0 494	0 484	1 099	0 881	572[23]		
38			F	0 970	0 437	0 534	1 103	0 884	574[23]		

/1/ The values from which this table has been synthesized are in many instances derived by calculation from basic assumptions, factors and constants, and do not have the same validity as actually measured values Those for women are in general less well founded than for men Values for carbamino CO_2 in particular, indicate order of magnitude rather than exact magnitudes /2/ Assumed normal values, lower than hematological standards in Table 37 partially due to rise in plasma volume in recumbent posture (vs standing). /3/ Exact value used in calculations = 39 6 and 60 4 /4/ 100ml R B C in contact with plasma, and 100ml plasma in contact with R B C. /5 O_2 capacity = grams Hb x 1 36 This factor based on hemoglobin Fe content of 0 339% /6/ Based on assumed hemoglobin con- [illegible] Table 37 (cf also footnote 2, present table) /7/ Exact [illegible]

[illegible] for plasma, "c" is calculated from K $K_{carbamino}$ (=1 2) and the mEq of plasma proteinate (=17 0) /23/ Arterial N_2 pressure taken as equal to alveolar air N_2 pressure the latter calculated by difference between 760 and sum of following O_2 = 100 CO_2 = 40, 39 water vapor = 47 Venous N_2 taken as equal to arterial Note that the total of blood gases and water vapor falls short of 760 in both arterial and venous bloods /24/ ml N_2 dissolved in 100ml R BC = 0 0146 x 100 x N_2 pressure/760 For plasma substitute 0 0117 for 0 0146

95. ARTERIAL BLOOD GASES, O_2 AND CO_2, AT ALTITUDE: MAN

"Ascent" in a Low Pressure Chamber For a Period Not Longer Than One Hour

	Altitude[1]	Arterial Blood Oxygen				Arterial Blood Carbon Dioxide	
		Tension mm Hg	Content[2] ml/100 ml	Capacity[2] ml/100ml	Saturation %	Tension[3] mm Hg	Content ml/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
1	Sea Level 760 mm Hg	94	21.1	A uniform Hb content of 15.8 g/100ml and therefore a uniform O_2 capacity of 21.5 ml/100ml are assumed.[4]	98	41	49
2, 3	5000 ft 1524 m 632 mm Hg	66	19.6		91 87-95[b]	36.5	
4, 5	8000 ft 2458 m 564 mm Hg	60	19.1		89 84 5-93.5[b]	37.4	
6, 7	10000 ft 3048 m 523 mm Hg	53	18.4		85.4 79-92[b]	35.8	
8, 9	12000 ft 3658 m 483 mm Hg	52	18.3		84.9 77-92 5[b]	34.8	
10, 11	14000 ft 4267 m 446 mm Hg	44	17.0		79.2 71-87.5[b]	35.4	
12, 13	16000 ft 4877 m 412 mm Hg	41	16.4		76.2 65-87.5[b]	33.8	
14, 15	18000 ft 5486 m 379 mm Hg	36	15.3		71.2 57-85.5[b]	31.8	
16, 17	20000 ft 6096 m 349 mm Hg	35	15.2		70.3 57 5-84[b]	29.4	

-scent to Altitudes (For a Period Not Longer Than One Hour) Which Necessitate the Use of Pure Oxygen

-de[1]	Arterial Blood Oxygen				Arterial Blood Carbon Dioxide	
	Tension mm Hg	Content[2] ml/100 ml	Capacity[2] ml/100ml	Saturation %	Tension mm Hg	Content ml/100ml
	(B)	(C)	(D)	(E)	(F)	(G)
Hg		19.8	A uniform Hb content of 15.8 g/100ml and therefore a uniform O_2 capacity of 21.5 ml/100ml are assumed.[4]	92 84-100[b]		
Hg	74	20.2		94	40.6	46.3
Hg	57	19.1		88.7	39.4	50.0
Hg	55	18.9		88.1 81-95[b]	35 26-44[b]	42.7 35-50[b]
Hg	54	18.6		86.4 85-88[b]	38.1	44.8
Hg	49	17.8		83 71-95[b]	40 36-44[b]	47.1 45-50[b]
Hg	42	16.9		78.5 65-92[b]		41.5 31-52[b]
Hg	36	15.5		72.2 58-86[b]	33.2	44.9
Hg		14.6		68 53-83[b]		

95. ARTERIAL BLOOD GASES, O_2 AND CO_2, AT ALTITUDE: MAN (Concluded)

Permanent Residents in Mountainous Regions (Complete Acclimatization)

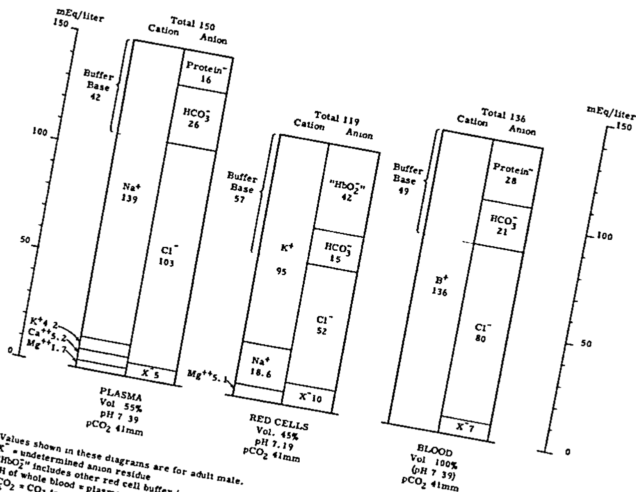
	Altitude[5]	Arterial Blood Oxygen				Arterial Blood Carbon Dioxide	
		Tension mm Hg	Content[2] ml/100ml	Capacity[2] ml/100ml	Saturation %	Tension[3] mm Hg	Content ml/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
34	492 ft[7] 150 m 746-752 mm Hg	90	20.7	21.7	95.4	41	46
35, 36	7840 ft 2390 m 568-581 mm Hg	68	21.2 18.5-24[b]	23.1 19-27.5[b]	91.7 86.5-97[b]	37.8 34-42[b]	41.1 37-45[b]
37, 38	10300 ft 3140 m 517-531 mm Hg	66	21.8 19-25[b]	24.0 22-26[b]	91.0 87-95[b]	36.4 31-42[b]	39.3 34.5-44[b]
39, 40	12238 ft 3730 m 479-482 mm Hg	57	21.9 18.5-25[b]	25.0 21.5-28.5[b]	87.6 84.5-91.5[b]		36.0 33-39[b]
41, 42	14896 ft 4540 m 431-448 mm Hg	47	23.0 19.5-26.5[b]	28.3 24-32.5[b]	81.4 75.5-87[b]	34.7 29-40[b]	33.5 32-35[b]
43, 44	15950 ft 4860 m 413-429 mm Hg	46	23.4 20.5-26.5[b]	29.0 25-33[b]	80.7 76-85[b]	33.0 28-38[b]	34.0 31-37[b]
45	17521 ft 5340 m 387-401 mm Hg	43	23.0	30.2	76.2	29.3	31.8

Newcomers[6] to Mountainous Regions (Incomplete Acclimatization)

	Altitude[5]	Arterial Blood Oxygen				Arterial Blood Carbon Dioxide	
		Tension mm Hg	Content[2] ml/100ml	Capacity[2] ml/100ml	Saturation %	Tension mm Hg	Content ml/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
46	11319 ft 3450 m 496-496 mm Hg	55	20.5	24.1	85	31	41
47	15421 ft 4700 m 429-429 mm Hg	44	18.7	24.1	78	29.3	38.3
48	17521 ft 5340 m 387-401 mm Hg	43	18.6	24.5	76.2	27.7	35.0
49	20145 ft 6140 m 347-356 mm Hg	35	16.3	24.9	65.6	24.2	30.2

/1/ U.S Standard Atmosphere. /2/ Values are for combined O_2 only, and do not include physically dissolved O_2. /3/ Excepting 1F, values represent alveolar tensions. /4/ 15.8 g Hb/100ml blood x 1.36 = ml O_2. /5/ Observed altitudes. First barometric pressure is U.S. Standard for observed altitude, second is average observed barometric pressure at time of measurements. /6/ Up to 16 days. Upon exposure of only 2 hours, values in columns C, D, E tend to be lower, in F, G, tend to be higher. /7/ Approximate sea level values for comparison.

96. IONIC BALANCE AND BUFFER BASE, ARTERIAL BLOOD, CELLS AND PLASMA: MAN



Values shown in these diagrams are for adult male.
X^- = undetermined anion residue
"HbO_2^-" includes other red cell buffer ions, such as organic phosphate
pH of whole blood = plasma pH
pCO_2 = CO_2 tension.
B^+ = mEq total base (Na^+, K^+, etc.) in one liter blood, on basis of hematocrit value of 45% red cells.
Buffer Base = that quantity of total base equivalent in amount (in terms of mEq) to the labile portion of the total anions, i.e., proteinate, bicarbonate, oxyhemoglobinate, organic phosphate and other red cell buffer ions.

95. ARTERIAL BLOOD GASES, O_2 AND CO_2, AT ALTITUDE: MAN (Concluded)

Permanent Residents in Mountainous Regions (Complete Acclimatization)

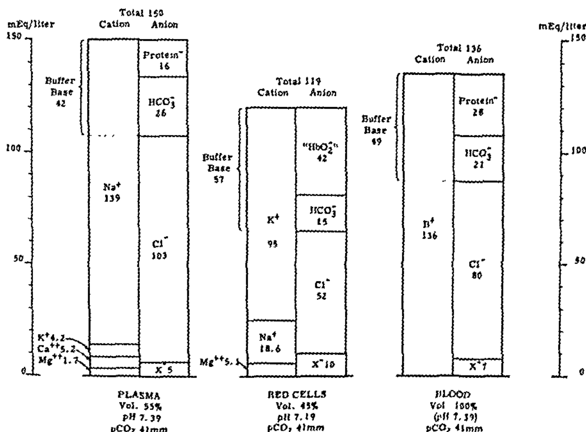
	Altitude[5]	Arterial Blood Oxygen: Tension mm Hg	Arterial Blood Oxygen: Content[2] ml/100ml	Arterial Blood Oxygen: Capacity[2] ml/100ml	Arterial Blood Oxygen: Saturation %	Arterial Blood Carbon Dioxide: Tension[3] mm Hg	Arterial Blood Carbon Dioxide: Content ml/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
34	492 ft[7] 150 m 746-752 mm Hg	90	20.7	21.7	95.4	41	46
35 36	7840 ft 2390 m 568-581 mm Hg	68	21.2 18.5-24[b]	23.1 19-27.5[b]	91.7 86.5-97[b]	37.8 34-42[b]	41.1 37-45[b]
37 38	10300 ft 3140 m 517-531 mm Hg	66	21.8 19-25[b]	24.0 22-26[b]	91.0 87-95[b]	36.4 31-42[b]	39.3 34.5-44[b]
39 40	12238 ft 3730 m 479-482 mm Hg	57	21.9 18.5-25[b]	25.0 21.5-28.5[b]	87.6 84.5-91.5[b]		36.0 33-39[b]
41 42	14896 ft 4540 m 431-448 mm Hg	47	23.0 19.5-26.5[b]	28.3 24-32.5[b]	81.4 75.5-87[b]	34.7 29-40[b]	33.5 32-35[b]
43 44	15950 ft 4860 m 413-429 mm Hg	46	23.4 20.5-26.5[b]	29.0 25-33[b]	80.7 76-85[b]	33.0 28-38[b]	34.0 31-37[b]
45	17521 ft 5340 m 387-401 mm Hg	43	23.0	30.2	76.2	29.3	31.8

Newcomers[6] to Mountainous Regions (Incomplete Acclimatization)

	Altitude[5]	Arterial Blood Oxygen: Tension mm Hg	Arterial Blood Oxygen: Content[2] ml/100ml	Arterial Blood Oxygen: Capacity[2] ml/100ml	Arterial Blood Oxygen: Saturation %	Arterial Blood Carbon Dioxide: Tension mm Hg	Arterial Blood Carbon Dioxide: Content ml/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
46	11319 ft 3450 m 496-496 mm Hg	55	20.5	24.1	85	31	41
47	15421 ft 4700 m 429-429 mm Hg	44	18.7	24.1	78	29.3	38.3
48	17521 ft 5340 m 387-401 mm Hg	43	18.6	24.5	76.2	27.7	35.0
49	20145 ft 6140 m 347-356 mm Hg	35	16.3	24.9	65.6	24.2	30.2

/1/ U.S. Standard Atmosphere. /2/ Values are for combined O_2 only, and do not include physically dissolved O_2. /3/ Excepting 1F, values represent alveolar tensions. /4/ 15.8 g Hb/100ml blood x 1.36 = ml O_2. /5/ Observed altitudes. First barometric pressure is U.S. Standard for observed altitude; second is average observed barometric pressure at time of measurements. /6/ Up to 16 days. Upon exposure of only 2 hours, values in columns C, D, E tend to be lower; in F, G, tend to be higher. /7/ Approximate sea level values for comparison.

96. IONIC BALANCE AND BUFFER BASE, ARTERIAL BLOOD, CELLS AND PLASMA: MAN



Values shown in these diagrams are for adult male
X^- = undetermined anion residue.
"HbO_2^-" includes other red cell buffer ions, such as organic phosphate.
pH of whole blood = plasma pH.
pCO_2 = CO_2 tension
B^+ = mEq total base (Na^+, K^+, etc.) in one liter blood, on basis of hematocrit value of 45% red cells.
Buffer Base = that quantity of total base equivalent in amount (in terms of mEq) to the labile portion of the total anions, i.e., proteinate, bicarbonate, oxyhemoglobinate, organic phosphate and other red cell buffer ions.

97. ACID-BASE VALUES, BLOOD AND PLASMA: MAN[1]

	Age, Sex		Hemoglobin: ation[2,3] blood, Range	Oxygen Satura %, Value	Oxygen Satura %, Rar	tal CO_2 Concentration[5]: r blood[6], Range	mM/liter plasma[6], Value	mM/liter plasma[6], Range	Plasma pH[7], Value	Plasma pH[7], Range	Buffer Base[8,9] Concentration m Eq/liter blood, Value	Buffer Base, Range	CO_2 Pressure[10,11] Blood or Plasma mm Hg, Value	CO_2 Pressure, Range	CO_2 Combining Power[12] ml gas/100ml plasma, Value	CO_2 Combining Power, Range
	(A)		(C)	(D)	(E	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
1	Birth to 10 days[13,14]	A														
2		C	7.7-12.3[b]	97[16]		14.8-21.8[b]	22.7[17]	18.3-27[b]	7.42	7.31-7.53[b]	47[17]	44-50[b]	34[17]	37-42[b]		
3		V		87[16]			23.6	19.8-25b	7.36	7.30-7.46[b]	45[17]		35[17]		57	
4	1 month to 2 years	A														
5		C														
6		V		87[16]			24.2	19.2-29[b]	7.38[17]		45[17]		38[18]		50	
7	6 to 18 years Boys, Girls	A		97[16]			25	22.4-28[b]	7.40	7.33-7.47[b]	46[17]		38[18]	29-47[b]		
8		C														
9		V		87[16]			27	23.3-30[b]	7.38	7.32-7.44[b]	48[17]		45[17]	33-50[b]	57	
10	Men, 18 to 50 years	A	8.7-10.3[b]	98	95-	20.4-24[b]	27	25-29[b]	7.39	7.33-7.45[b]	49[17]	46-53[b]	42	38-47[b]		
11		C	8.4-10.4[b]	97[18]		19.8-25[b]	27[17]		7.39	7.33-7.45[b]	49[17]		45[17]	35-50[b]		
12		V		67	40-	20.6-28[b]	29	24-34[b]	7.35	7.27-7.43[b]	49[17]		49[17]		65	58-73[b]
13	Women, 18 to 50 years	A														
14		C	8.7-9.1[b]	97[16]		19.5-25[b]	26[17]		7.41	7.35-7.47[b]	47[17]		39[17]	34-44[b]		
15		V		63	37-		27	23.7-31[b]	7.37	7.31-7.43[b]	46[17]		44[17]		61	52-70[b]
16	Men over 50 years[20]	A	8.7-9.7[b]	93	89-	18.3-25[b]	25[17]		7.42	7.32-7.53[b]	45[17]		37[18]	29-45[b]		
17		C	7.6-10.3[b]	98[16]		20.3-26.3[b]	27[17]		7.39	7.32-7.46[b]	49[17]		43	33-50[b]		
18		V														
19	Women, over 50 years	A	8.2-9.4[b]	97	93-	17.7-24.5[b]	25[17]		7.42	7.34-7.50[b]	45[17]		36	28-44[b]		
20		C														
21		V														

/1/ Persons in good health, resting, at or near sea level (barometric pressure 760 mm Hg). Blood at 37°C. /2/ Assumed concentration of 20 mM hemoglobin per liter red cells. One mM (single Fe-atom structure, molecular weight 16,500) combines with 22.4 ml of O_2, S. T. P., when saturated (cf footnote 4). /3/ Hemoglobin and hematocrit values average 6% lower in recumbency than in erect posture, because of increase in plasma volume. Arterial values are for recumbent posture, cutaneous values for sitting posture. Posture for venous values unknown. /4/ In healthy adults and children, arterial hemoglobin oxygen saturation = 98%, oxygen pressure 95mm Hg. Lower saturation in smokers, whose blood may contain 1% to 8% carbon monoxide hemoglobin. Errors in analysis tend to give lower oxygen saturation values. /5/ Measured by Van Slyke methods, taking account of "i" factor. One mM of CO_2 gas = 22.26 ml S. T. P. (CO_2) mM/liter = (CO_2) values % / 2.226. /6/ Whole blood and plasma CO_2 concentrations can be calculated one from the other, when pH, O_2 saturation and hemoglobin or hematocrit are known. Whole blood CO_2 concentration is in part a function of the relative amounts of plasma and red cells (cf Table 96). /7/ pH at 37°C, plasma in contact with red cells; M/15 phosphate reference buffers; potentiometric or colorimetric methods. Or pH calculated from CO_2 pressure by Henderson-Hasselbalch equation at 37°: $pH = 6.10 + \log\frac{(CO_2) - 0.0314pCO_2}{0.0314pCO_2}$, where plasma CO_2 concentration is in mM/liter and CO_2 pressure is in mm Hg. /8/ Calculated from pH, O_2 saturation, hemoglobin concentration, CO_2 concentration, plasma protein concentration. The net effect on blood acid-base balance of any non-respiratory distortion of the blood ionic pattern (cf Table 98) is epitomized in the resulting value for buffer base. It is increased by addition of excess base to the blood, decreased by excess acid (other than H_2CO_3). It is also decreased about 0.6 mM/mEq/liter for each mM/liter decrease in hemoglobin content. /9/ Buffer base increased during the "alkaline tide" of digestion, decreased in early morning (averages 2mEq/liter less than during rest of day). /10/ Calculated from pH and plasma CO_2 concentration (footnote 7) or from pH and whole blood CO_2 concentration. In some of the data sources, the CO_2 pressure was determined by interpolation on the CO_2 dissociation curve. CO_2 solubility coefficient in plasma = 0.0314 mM/liter/mm pCO_2 at 37°C. /11/ The pCO_2 of arterial or cutaneous blood is virtually identical with that of alveolar air and is the best measure of the respiratory factor in acid-base balance. Given the O_2 saturation and hemoglobin content, the two factors, pCO_2 and buffer base, may be regarded as determining the pH, CO_2 and bicarbonate concentrations and other buffer anion concentrations. Apprehension increases respiration, reduces arterial pCO_2 and CO_2 content and raises pH. Arterial pCO_2 lower in infants than adults, about 3mm lower in women than in men, about 3mm lower in erect vs recumbent posture, about 2mm lower premenstrually, about 8mm higher in sleep. /12/ Method of Van Slyke and Cullen. The CO_2 combining power is roughly equivalent to the more precise CO_2 concentration. /13/ Full term, age 0-10 days, breast fed. A recent study of 60 premature infants indicates even greater departure from adult standards. Values found, adjusted to 37°C, were: CO_2 concentration, 20.1 mM/liter plasma; pH, 7.32; pCO_2, 38 mm Hg. /14/ A parallel series of infants of the same age, fed on an evaporated milk formula, had cutaneous blood values: whole blood CO_2, 15.3 mM/liter; plasma CO_2, 19.0 mM/liter; pH, 7.38; pCO_2, 31 mm Hg; buffer base 42.3 mEq/liter. /15/ A = arterial blood; C = cutaneous blood, V = venous blood, antecubital except in case of 3 A-P, where jugular blood was used. /16/ This value is assumed: infant equivalent to adult, female to male, cutaneous blood to arterial. /17/ This value calculated from other data in the table. /18/ The difference between the CO_2 pressure for youths and old men and that for men 18-50 years of age as shown here is greater than expected, but the direction of the difference is supported by comparative studies. /19/ Assumed to be 12% lower than in male venous blood on basis of sex difference in hemoglobin (cf Table 37). /20/ In another smaller series of observations, arterial values found were: hemoglobin, 8.9mM/liter; whole blood CO_2, 22.1 mM/liter; calculated plasma CO_2, 26.8mM/liter, calculated pH, 7.39; pCO_2, 43 mm Hg; buffer base, 47 mEq/liter.

98. EFFECTS OF RADIATION ON PERIPHERAL BLOOD

	Type Radiation (A)	Application (B)	Application (C)	Accumulated Dose or Exposure Time (D)	Effects (E)
			Man		
1	X-ray (200 KVP, 400 KVP, 1000 KVP)	Chronic, total body	15-20 r	40 r	Decreased lymphocytes
2		Chronic, total body	5-10 r/day	200-300 r	Decreased lymphocytes
3		Chronic, total body	5-20 r/day	88-300 r	Decreased lymphocytes, neutrophils, WBC, RBC, Hb. Increased monocytes
4		Chronic, total body		? dose. Presumably greater than 0.1 r/day	Increased incidence of leukemia
5	High energy gamma	Chronic, total body	0.2 r/week	77 weeks	Decreased WBC, absolute lymphocytes, absolute neutrophils
			Dog		
6	200 KVP x-ray	Acute, total body	20 r		Decreased absolute lymphocytes
7		Acute, total body	50 r		Decreased: absolute lymphocytes platelets, WBC, granulocytes
8		Acute, total body	200 r		Decreased: absolute lymphocytes, platelets, WBC, granulocytes, reticulocytes
9	X-ray (250 KVP, 1000 KVP)	Chronic, total body	0.5 r/day 6 days/week	2 years	Decreased lymphocytes
10		Chronic, total body	1.0 r/day 6 days/week	1- year	Decreased. lymphocytes, WBC, neutrophils
11	X-ray (250 KVP, 1000 KVP)	Chronic, total body	3 r/day 6 days/week	1-2 mo.	Decreased absolute lymphocytes, reticulocytes, platelets
12		Chronic, total body	6 r/day 6 days/week	1-2 mo	Decreased WBC, absolute, lymphocytes, absolute neutrophils, platelets
13	X-ray (200 KVP)	Chronic, total body	10 r/day 6 days/week	1 month	Decreased absolute lymphocytes, absolute neutrophils, WBC, RBC, Hb, reticulocytes
14		Chronic, total body	12.5 r/day	1262 r	Aplastic anemia
15	Fast neutrons	Chronic, total body	1 7 n/day 6 days/week	1 year	Decreased WBC, absolute lymphocytes, absolute neutrophils, platelets, RBC
16		Chronic, total body	1 7 n/day 6 days/week	3-4 weeks	Decreased WBC, absolute lymphocytes, absolute neutrophils
			Goat		
17	X-ray (200 KVP)	Acute, total body	300 r		Decreased lymphocytes, neutrophils, WBC, RBC, Hb.

98. EFFECTS OF RADIATION ON PERIPHERAL BLOOD (Continued)

	Type Radiation	Application		Accumulated Dose or Exposure Time	Effects
	(A)	(B)	(C)	(D)	(E)
	Guinea pig				
18	Gamma (radium)	Chronic, total body	0.11 r/day	approx. 1 mo.	Decreased: lymphocytes, WBC, heterophils
19		Chronic, total body	1.1 r/day	approx. 1 mo.	Decreased: lymphocytes, WBC, heterophils
20		Chronic, total body	1.1 r/day	approx. 1 year	Decreased: lymphocytes, WBC, heterophils, (platelets, in females only)
21		Chronic, total body	2.2 r/day	approx. 1 mo.	Decreased: lymphocytes, WBC, heterophils
22		Chronic, total body	2.2 r/day	approx. 1 year	Decreased: lymphocytes, WBC, heterophils, platelets
23		Chronic, total body	2.2 r/day	79 weeks	Decreased: lymphocytes, WBC, heterophils, (RBC, Hb, males only)
24		Chronic, total body	4.4 r/day	approx. 1 mo.	Decreased: lymphocytes, WBC, heterophils
25		Chronic, total body	4.4 r/day	approx. 1 year	Decreased: lymphocytes, WBC, heterophils, platelets, RBC, Hb.
26		Chronic, total body	8.8 r/day	10 days	Decreased: lymphocytes, WBC
27		Chronic, total body	8.8 r/day	approx. 1 mo	Decreased: lymphocytes, WBC, heterophils, platelets
28		Chronic, total body	8.8 r/day	19 weeks	Decreased: lymphocytes, WBC, heterophils, RBC, Hb.
	Mouse				
29	X-ray (200 KVP)	Acute, total body	50 r		Decreased: lymphocytes, WBC
30	X-ray (166 KV)	Acute, total body	400 r		Decreased: lymphocytes, WBC, granulocytes, reticulocytes, RBC, Hb.
31	Fast neutrons (cyclotron)	Chronic, total body	0.07 n/day 5 days/week	30 n	Decreased: WBC
32		Chronic, total body	1.4 n/day 5 days/week	230 n	Decreased: absolute lymphocytes, WBC, RBC, Hb.
33					Increased: frequency of WBC below 15,000/mm^3
34					Shift to left present in heterophils
35	Gamma (radium)	Chronic, total body	2.2 r/day	29 weeks	Decreased: WBC, absolute lymphocytes
36		Chronic, total body	4.4 r/day	29 weeks	Decreased: WBC, absolute lymphocytes
37		Chronic, total body	4.4 r/day	79 weeks	Decreased: WBC, absolute lymphocytes, (RBC, Hb, platelets, males only)
38		Chronic, total body	8.8 r/day	29 weeks	Decreased: WBC, absolute lymphocytes
39		Chronic, total body	8.8 r/day	29 weeks	Decreased: WBC, absolute lymphocytes, RBC, Hb, platelets

98. EFFECTS OF RADIATION ON PERIPHERAL BLOOD (Continued)

	Type Radiation (A)	Application (B)	(C)	Accumulated Dose or Exposure Time (D)	Effects (E)
			Rabbit		
40	X-ray (9200 KVP)	Acute, total body	25 r		Decreased: absolute lymphocytes
41		Acute, total body	100 r		Decreased: absolute lymphocytes, WBC, platelets, reticulocytes, granulocytes
42		Acute, total body	500 r		Decreased absolute lymphocytes, WBC platelets, reticulocytes, granulocytes, RBC, Hb.
43	X-ray (250 KVP, 1000 KVP)	Chronic, total body	10 r/day 6 days/week	60-120 r	Decreased absolute lymphocytes, absolute neutrophils, WBC
44		Chronic, total body	10 r/day 6 days/week	720-960 r	Decreased WBC, absolute lymphocytes, absolute neutrophils, RBC, platelets
45	Fast neutrons (cyclotron)	Chronic, total body	1.7 n/day 6 days/week	15-45 n	Decreased absolute lymphocytes, WBC
46		Chronic, total body	1 7 n/day 6 days/week	50-75 n	Decreased absolute lymphocytes, absolute neutrophils, WBC
47		Chronic, total body	1 7 n/day 6 days/week	325 n	Decreased. absolute lymphocytes, absolute neutrophils, WBC, RBC, Hb
48	Fast neutrons (pile)	Acute, total body	9 n		Decreased absolute lymphocytes
49		Acute, total body	26 n		Decreased absolute lymphocytes and heterophils
50		Acute, total body	68-76 n		Decreased absolute lymphocytes, heterophils, and platelets
51		Acute, total body	128 n		Decreased absolute lymphocytes, heterophils, platelets, RBC, Hb
52	Gamma (radium) (females only)	Chronic total body	1 1 r/day	approx 2 mos	Decreased absolute lymphocytes
53		Chronic, total body	2 2 r/day	approx 2 mos	Decreased absolute lymphocytes
54		Chronic, total body	2 2 r/day	approx 9 mos	Decreased absolute lymphocytes, platelets
55		Chronic total body	4 4 r/day	approx 2 mos	Decreased absolute lymphocytes
56		Chronic, total body	4 4 r/day	approx 9 mos	Decreased absolute lymphocytes, platelets
57		Chronic, total body	8.8 r/day	approx 2 mos	Decreased absolute lymphocytes,
58		Chronic, total body	8 8 r/day	approx 9 mos	Decreased absolute lymphocytes, platelets

98. EFFECTS OF RADIATION ON PERIPHERAL BLOOD (Concluded)

	Type Radiation	Application		Accumulated Dose or Exposure Time	Effects
	(A)	(B)	(C)	(D)	(E)
	Rat				
59	250 KVP X-ray	Acute, total body	5 r		Decreased: absolute lymphocytes
60		Acute, total body	10 r		Decreased: absolute lymphocytes, WBC
61		Acute, total body	50 r		Decreased: neutrophils, WBC, absolute lymphocytes, reticulocytes
62		Acute, total body	100 r		Decreased: absolute lymphocytes, neutrophils, WBC, reticulocytes, platelets
63		Acute, total body	300 r		Decreased: absolute lymphocytes, neutrophils, WBC, reticulocytes, platelets, RBC, Hb
64	X-ray (250-1000 KVP)	Chronic, total body	0.5 r/day	2 years	Decreased: absolute lymphocytes
65		Chronic, total body	1 r/day	1 year	Decreased: absolute lymphocytes
66	Fast neutrons	Chronic, total body	1.7 n/day 6 days/week	1 mo.	Decreased: absolute lymphocytes
67		Chronic, total body	1.7 n/day 6 days/week	1 year	Decreased: absolute lymphocytes, RBC, Hb.
	Chick				
68	X-ray (85 KV)	Acute, total body	360 r		Decreased: lymphocytes
69	X-ray (200 KVP)	Acute, total body	600 r		Decreased: lymphocytes, WBC, heterophils, thrombocytes, RBC, Hb, reticulocytes
	Salmon				
70	X-ray (200 KV)	Acute, total body	750 r		Decreased: nucleated cells in peripheral blood

99. EFFECTS OF RADIATION ON HEMATOPOIETIC TISSUES

	Radiation (A)	Dose and Application (B)	Tissue (C)	Main Histological Effect (D)	Time Post-Exposure When First Observed[1] (E)	Time Post-Exposure When Definite Recovery Began[1] (F)
1				Man		
2	X-ray (150-175 KV)	100 r, Acute, localized (therapeutic irradiation single dose)	Sternal marrow	Decreased erythroblasts	2 days	complete by one month
3				Decreased myeloid cells	3 days	complete by one month
4		200 r, Acute, localized (therapeutic irradiation single dose)	Sternal marrow	Decreased erythroblasts	2 days	----
5				Decreased myeloid cells	2 days	----
6		300 r, Acute, localized (therapeutic irradiation single dose)	Sternal marrow	Decreased erythroblast mitosis	2 days	4 days
7				Decreased mitosis	1 day	1-2 months
				Decreased erythroid cells	1 day	1-2 months
8				Decreased myeloid cells	1 day	1-2 months
9		2000 r, Acute localized (therapeutic irradiation single dose)	Sternal marrow	Transient aplasia	----	----
10		3000 r, or more, Acute, localized (therapeutic irradiation single dose)	Sternal marrow	Permanent aplasia	----	----
11				Dog		
12	X-ray (250 KVP)	300 r, Acute, total body	Bone marrow	Decreased cellularity	As early as 2 days post-radiation	24-28 days
13				Decreased myeloid cells	2 days	24 days
14				Decreased erythroid cells	2 days	4 days
				Reversed myeloid-erythroid ratio	7-9 days	40 days
15				Guinea pig		
16	X-ray (200 KVP)	175 r, Acute, total body	Lymph node	Increased debris	3 hrs	24 hrs.
17				Slight decreased cellularity	3-8 hrs	by 4 days
				Increased heterophils	3 hrs	48 hrs

1/ Time represents an approximation The figures given have been determined, in large part, by frequency of sampling.

99. EFFECTS OF RADIATION ON HEMATOPOIETIC TISSUES (Continued)

	Radiation	Dose and Application	Tissue	Main Histological Effect	Time Post-Exposure When First Observed[1]	Time Post-Exposure When Definite Recovery Began[1]
	(A)	(B)	(C)	(D)	(E)	(F)
	Mouse					
18	X-ray (200 KVP)	50 r, Acute, total body	Bone marrow	Increased myeloid cells	8 hrs.	----
19				Increased myeloblasts	12 hrs.	----
20		350 r, Acute, total body	Bone marrow	Increased: debris	3 hrs.	5 days
21				Decreased erythropoiesis	3 hrs.	5-9 days
22				Decreased myelopoiesis	3 hrs.	5 days
23	X-ray (186 KV)	400 r, Acute, total body	Bone marrow	Decreased. lymphocytes	1 day	----
24				Decreased normoblasts	1 day	7 days
25				Decreased cellularity	1 day	7 days
26				Decreased myelopoiesis	2 days	7-14 days
27				Shift to left present in myelocytic series	10 days	----
28	Fast neutrons (pile)	117 n, Acute, total body	Bone marrow	Cell death	3 hrs.	----
29				Decreased cellularity	3 hrs	5-9 days
30				Increased debris	3 hrs.	----
31				Cytological damage, megakaryocytes	1 day	----[2]
32				Increased spindle cells	9 days	----[2]
33		96 n, Acute, total body	Bone marrow	Increased debris	3 hrs.	----
34				Decreased cellularity	3 hrs.	3 days
35	X-ray (200 KVP)	50 r, Acute, total body	Lymph nodes and spleen	Occurrence of giant cells	4 hrs.	----
36				Increased debris in follicles	4 hrs.	----
37				Necrotic foci in germinal follicles	8-12 hrs	----

/1/ Time represents an approximation The figures given have been determined, in large part, by frequency of sampling.
/2/ Not recovering at time last sample studied.

99. EFFECTS OF RADIATION ON HEMATOPOIETIC TISSUES (Continued)

	Radiation (A)	Dose and Application (B)	Tissue (C)	Main Histological Effect (D)	Time Post-Exposure When First Observed[1] (E)	Time Post-Exposure When Definite Recovery Began[1] (F)
				Mouse (Continued)		
38	X-ray (186 KV)	400 r, Acute, total body	Lymph nodes	Decreased cellularity	2-3 hrs.	4 days
39				Increased debris	2-3 hrs	----
40				Cytological damage	2-3 hrs.	4 days
41				Disappearance of secondary nodules	48 hrs.	7-14 days
42				Increased extramedullary myelopoiesis	3-4 weeks	----[2]
43	Fast neutrons (pile)	96 n, Acute, total body	Lymph nodes	Complete destruction of nodules	1/2 hr.	3-9 days
44	X-ray (186 KV)	400 r, Acute, total body	Spleen	Decreased mitosis	2-3 hrs	7-10 days
45				Cytological damage, lymphocytes	2-3 hrs.	7-10 days
46				Increased, debris	2-3 hrs	----
47				Decreased erythropoiesis	2-3 hrs.	7-10 days
48				Decreased megakaryocytes	2-3 hrs	10-14 days
49				Increased extramedullary myelopoiesis	10 days	----[2]
				Rabbit		
50	X-ray (200 KVP)	100 r, Acute, total body	Bone marrow	Decreased mitosis	Almost immediately after exposure	3 hrs.
51		400 r, Acute, total body	Bone marrow	Abnormal mitosis	8 hrs.	14 hrs
52				Decreased mitosis	3 hrs	----
53				Decreased erythropoiesis	3 hrs	14 days
54				Decreased granulocytopoiesis	1 day	before 14 days
55				Increased debris	3 hrs	----
56		800 r, Acute total body	Bone marrow	Cessation of mitosis	1/2 hr.	10 days
57				Decreased erythropoiesis	1/2 hr	10-14 days
58				Increased debris	3 hrs	----
59				Decreased myelopoiesis	1 day	14 days

/1/ Time represents an approximation. The figures given have been determined, in large part, by frequency of sampling
/2/ Not recovering at time last sample studied

99. EFFECTS OF RADIATION ON HEMATOPOIETIC TISSUES (Continued)

	Radiation	Dose and Application	Tissue	Main Histological Effect	Time Post-Exposure When First Observed[1]	Time Post-Exposure When Definite Recovery Began[1]
	(A)	(B)	(C)	(D)	(E)	(F)
	Rabbit (Cont'd)					
60	X-ray (200 KVP)	800 r, Acute, total body	Bone marrow	Decreased. megaloblasts	2 days	21 days
61		50 r, Acute, total body	Lymph nodes	Increased. debris	3 hrs.	10 hrs.
62		100 r, Acute, total body	Lymph nodes	Increased. debris	3 hrs.	24 hrs.
63	X-ray (200 KVP)	400 r, Acute, total body	Lymph nodes	Increased: debris	within 3 hrs.	----
64				Decreased. cellularity of nodules	3 hrs.	24 hrs.
65				Infiltration with heterophils	1st day	----
66				Decreased: mitosis	3 hrs.	8 hrs.
67				Shift to left in lymphocytes	8-16 hrs.	----
68	X-ray (200 KVP)	800 r, Acute, total body	Lymph nodes	Decreased: mitosis	30 min.	5 days
69				Destruction of lymphocytes	30 min.	5 days
70				Disappearance of nodules	17-24 hrs	21 days
71				Increased debris	30 min.	17 hrs.
72				Increased spindle cells	24 hrs.	----
73				Increased plasma cells	9 days	----
74	X-ray (200 KVP)	25 r, Acute, total body	Spleen	Increased debris	1 day	----
75				Cytological damage	1 day	----
76		50 r, Acute, total body	Spleen	Decreased mitosis	1 day	----
77				Cytological damage	1 day	----
78	X-ray (200 KVP)	600 r, Acute, total body	Spleen	Cessation of mitosis	1 hr.	8 hrs.
79				Increased· debris	1 hr.	8 hrs.
80				Cytological damage	1 hr.	----
81				Decreased cellularity	1 hr	9 days

/1/ Time represents an approximation. The figures given have been determined, in large part, by frequency of sampling.

99. EFFECTS OF RADIATION ON HEMATOPOIETIC TISSUES (Continued)

	Radiation (A)	Dose and Application (B)	Tissue (C)	Main Histological Effect (D)	Time Post-Exposure When First Observed[1] (E)	Time Post-Exposure When Definite Recovery Began[1] (F)
	Rabbit (Cont'd)					
82	X-ray (200 KVP)	800 r, Acute, total body	Spleen	Decreased size	1 day	----
83				Cessation of mitosis	1/2 hr.	8 hrs.
84				Cytological damage (lymphocytes)	1/2 hr.	----
85				Increased debris	1/2 hr.	8 hrs.
86				Destruction of lymphocytes	3 hrs.	9 days
87				Decreased cellularity	3 hrs.	9 days
88				Increased plasma cells	9 days	----
89				Decreased erythroblasts	24 hrs.	14 da- -
90				Decreased myelocytes	2 days	14 days
	Rat					
91	X-ray (200 KVP)	400 r, Acute, total body	Lymph nodes	Cytological damage (lymphocytes)	within 16 hrs.	3 days
92				Degeneration of nodule	within 16 hrs	3 days
93	X-ray (200 KVP)	600 r, Acute, total body	Lymph nodes	Cytological damage (lymphocytes)	1/2 hr.	14-1/2 hrs.
94				Degenerative change (nodules)	14-1/2 hrs	21 days
95				Disappearance of nodules	24 hrs.	21 days
96				Infiltration with heterophils	8 hrs	----
97				Hemorrhage	all periods up to 31 days	----2
98	X-ray (250 KVP)	550 r, Acute, total body	Spleen	Increased debris	30 min.	8 hrs.
99				Destruction of lymphocytes	2 hrs.	----
100				Disappearance of nodules	30 hrs.	15 days
101				Decreased cellularity	2 hrs	9 days

/1/ Time represents an approximation The figures given have been determined, in large part, by frequency of sampling.
/2/ Not recovering at time last sample studied

	Radiation	Dose and Application	Tissue	Main Histological Effect	Time Post-Exposure When First Observed[1]	Time Post-Exposure When Definite Recovery Began[1]
	(A)	(B)	(C)	(D)	(E)	(F)
	Rat (Continued)					
102	X-ray (200 KVP)	600 r, Acute, total body	Spleen	Decreased megakaryocytes	3 days	3 weeks
103	X-ray (200 KVP)	600 r, Acute, total body	Spleen	Cytological damage (erythroblasts)	3 hrs.	----
104	X-ray (200 KVP)	600 r, Acute, total body	Spleen	Decreased erythropoiesis	8 hrs.	9 days
105	X-ray (200 KVP)	600 r, Acute, total body	Spleen	Destruction of lymphocytes	3 hrs.	----
106	X-ray (200 KVP)	600 r, Acute, total body	Spleen	Decreased mitosis	1/2 hr	8 hrs.
107	X-ray (200 KVP)	600 r, Acute, total body	Spleen	Decreased cellularity of nodules	3 hrs.	14 days
108	X-ray (200 KVP)	550 r, Acute, total body	Marrow	Decreased lymphocytes	15 min.	12 days
109	X-ray (200 KVP)	550 r, Acute, total body	Marrow	Decreased megakaryocytes	3 hours	14 days
110	X-ray (200 KVP)	550 r, Acute, total body	Marrow	Decreased myeloid cells	30-45 hrs.	14 days
111	X-ray (200 KVP)	550 r, Acute, total body	Marrow	Decreased erythroid cells	6-15 hrs.	5 days
112	X-ray (200 KVP)	600 r, Acute, total body	Marrow	Increased debris	3 hrs.	----
113	X-ray (200 KVP)	600 r, Acute, total body	Marrow	Decreased erythropoiesis	3 hrs.	9 days
114	X-ray (200 KVP)	600 r, Acute, total body	Marrow	Decreased myelopoiesis	2 days	31 days
115	Fast neutrons (cyclotron)	56 4 n		Decreased megakaryocytes, granulocytes, erythroid cells, cellularity, mitosis	----	16 days
	Chick					
116	X-ray (200 KVP)	25 r, Acute, total body	Bone marrow	Cytological damage (lymphocytes)	----	----
117	X-ray (200 KVP)	100 r, Acute, total body	Bone marrow	Decreased mitosis, cellularity	30 min 13 hrs	2 hrs. 12 days
118	X-ray (200 KVP)	400 r, Acute, total body	Bone marrow	Decreased lymphocytes	7 hrs.	13-48 hrs.
119	X-ray (200 KVP)	400 r, Acute, total body	Bone marrow	Decreased myelocytes	7 hrs.	13-48 hrs.
120	X-ray (200 KVP)	400 r, Acute, total body	Bone marrow	Decreased erythroblasts	7 hrs.	13-48 hrs.

/1/ Time represents an approximation. The figures given have been determined, in large part, by frequency of sampling.

99. EFFECTS OF RADIATION ON HEMATOPOIETIC TISSUES (Concluded)

	Radiation (A)	Dose and Application (B)	Tissue (C)	Main Histological Effect (D)	Time Post-Exposure When First Observed[1] (E)	Time Post-Exposure When Definite Recovery Began[1] (F)
	Chick (Continued)					
121	X-ray (200 KVP) (Continued)	800 r, Acute, total body	Bone marrow	Decreased mitosis	45 min.	----[2]
122				Erythropoiesis abolished	1 hr.	2-4 days
123				Erythroblasts destroyed	1 hr.	2-4 days
124				Small lymphocytes destroyed	1-2 hrs.	----[2]
125				Increased debris	1-2 hrs	----
126				Granulocytopoiesis destroyed	14 hrs.	----[2]
127	X-ray (200 KVP)	25 r, Acute, total body	Spleen	Cytological damage (lymphocytes)	----	----
128		100 r, Acute, total body	Spleen	Debris and dead lymphocytes	1/2 hr.	18 hrs.
129		400 r, Acute, total body	Spleen	Decreased mitotic activity	1/2 hr	7 hrs.
130				Destruction of small lymphocytes	1/2 hr.	3 days
131				3/4 of small lymphocytes killed	4 hrs	3-5 days
132		800 r, Acute, total body	Spleen	Cessation of mitosis	45 min.	5 hrs.
133				Destruction of lymphocytes	45 min	9 days
134				Increased hemocytoblasts	45 min.	1-3 days
135				Increased plasma cells	2 hrs	----
	Salmon					
136	X-ray (200 KVP)	500 r, Acute, total body	Kidney	Decreased hematopoietic cells in hematopoietic tissue	----	----

/1/ Time represents an approximation. The figures given have been determined, in large part, by frequency of sampling.
/2/ Not recovering at time last sample studied.

100. CHANGES IN STORED PRESERVED BLOOD

	Variable	Preservative[2]	0 days			10 days			20 days			30 days			40 days		
			Blood	RBC	Plasma	Blood	RBC	Plasma	Blood	RBC	Plasma	Blood	RBC	Plasma	Blood	RBC	Plasma
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
1	pH[3]	C	7.4			7.1			7.1								
2		CD	7.4			7.1			6.8			6.7			6.7		
3		ACD	7.1			6.7			6.6			6.6			6.6		
4	Potassium (mEq/1000 ml)	C		100	5		75	23		63	32						
5		CD		100	5		74	20		65	25		60	28		53	34
6		ACD		90	5		75	12		68	19		60	23		53	27
7	Sodium (mEq/1000 ml)	C		25	166		45	149		55	142						
8		CD		21	158		40	148		47	145		52	142		58	138
9		ACD		18	160		25	152		30	148		37	142		42	137
10	Inorganic Phosphorus (mg/100 ml)	C		0	0		35	7		35	10						
11		CD		0	2		10	3		28	6		29	10		26	12
12		ACD		5	2		18	5		25	8		25	9		25	10
13	Adenosine Triphosphate (mg/100 ml)	C		15			5			2							
14		CD		15			9			5			2			2	
15		ACD		15			14			12			9			6	
16	Lactic acid[4] (mg/100 ml)	C	20			80		80									
17		CD	10			135		185				210					
18		ACD	20			90		130				155			170		
19	Glucose[5] (mg/100 ml)	C	70			10^6			10^6			10^6					
20		CD	720[7]			650[7]			575[7]			520					
21		ACD	670[8]			600[7]			550[7]			470					

/1/ Whole preserved (C, CD, and ACD) human blood kept at 4°C and analyzed within 20 minutes after removal from storage. /2/ Preservative C: 3.2 g trisodium citrate-di-H_2O, in 100 ml aqueous solution, pH 7.5 (effective tonicity re blood = 141%). Ten ml added to 100 ml blood, increasing blood citrate by 10 mM/liter, and plasma citrate by 17 mM/liter. Preservative CD: 2.13 g trisodium citrate-di-H_2O, plus 5 g glucose anhydrous, in 100 ml aqueous solution, pH 7.5 (effective tonicity re blood = 94%). Fifteen ml added to 100 ml blood, increasing blood citrate by 11 mM/liter, and plasma citrate by 19 mM/liter, blood glucose by 650 mg/100 ml. Preservative ACD: 1.33 g trisodium citrate-di-H_2O, plus 470 mg citric acid, plus 3 g glucose anhydrous, in 100 ml aqueous solution, pH 5.03 (effective tonicity re blood = 66%). Twenty-five ml added to 100 ml blood, increasing blood citrate by 13 mM/liter, plasma citrate by 21 mM/liter, blood glucose 600 mg/100 ml, citric acid by 16.5 mEq/liter. Blood changes in 8 days with C equivalent to 18 days with CD equivalent to 33 days with ACD. /3/ pH measured at 37.5°C. Blood and plasma, same pH. /4/ Determined by modified aeration-titration method of Friedman. /5/ Determined by Nelson modification of Somogyi method. /6/ Residual non-fermentable reducing substances. /7/ Normal blood glucose plus glucose in CD. /8/ Normal blood glucose plus glucose in ACD.

100. CHANGES IN STORED PRESERVED BLOOD (Concluded)

Variable		Preservative	0 days Blood	0 days RBC	0 days Plasma	10 days Blood	10 days RBC	10 days Plasma	20 days Blood	20 days RBC	20 days Plasma	30 days Blood	30 days RBC	30 days Plasma	40 Days Blood	40 Days RBC	40 Days Plasma
(A)		(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
Glycolysis Rate[9]	(mg glucose/100 ml RBC/hr)	C		50			10[10]			1[10]							
	(mg lactic acid/100 ml RBC/hr)	CD		40[11]			20[11]			6[11]							
		ACD		17[11]			17[11]			17[11]			13[11]			4[11]	
Dimensions of R B C[12] (μ)	Diam. Thick.	C	7.69 1.80			6.92 2.32			6.25 3.05								
	Diam. Thick	CD	7.50 2.08			7.33 2.30			6.92 2.58			6.33 3.23			6.00 3.65		
	Diam. Thick	ACD	7.42 2.33			7.33 2.38			7.17 2.52			6.83 2.70			6.50 3.00		
Hemolysis,[13] (Per cent of RBC hemolysed)	% NaCl 0.9	C	0			2.5			9.8								
	0.8		0			7.5			30								
	0.7		0			34			61								
	0.6		0			43			68								
	0.5		0			60			80			68					
	0.9	CD	0			0			2			6					
	0.8		0			0			7			30			50		
	0.7		0			2			16			48			60		
	0.6		0			3.6			25			64			76		
	0.55		5			16			56			80			85		
	0.9	ACD	0			0			0			0.8			1.8		
	0.8		0			0			0			2.2			15.5		
	0.7		0			0			0			10			34		
	0.6		0			4.2			13.7			28			65		
	0.55		4.4			11.1			24.4			32.2			67.8		
Hemoglobin in Plasma (mg/100 ml)		C[14]	1			11											

/9/ Blood incubated 90 minutes at 37°C, measured lactic acid produced and glucose lost. /10/ Glycolysis measured by breakdown of added glucose as glucose originally present has disappeared. see Fn 6. /11/ Glycolysis involves breakdown of added glucose, see Fn 7, 8. /12/ Mean Corpuscular Volume (M.C.V.) = Hematocrit, RBC count per mm³ blood. Hematocrit determined by method of Guest and Siler. Mean diameter read from stained film covered with 0.9% NaCl. Mean Thickness = M.C.V./π(Diam./2)^2. /13/ Determined colorimetrically /14/ 4% sodium citrate.

101. EFFECTIVE BLOOD LEVELS OF THERAPEUTIC AGENTS

	Therapeutic Agent	Therapeutic Use	Dosage	Method of Admin.	Time after Admin.	Blood mg/100ml	Plasma mg/100ml	Serum mg/100ml	RBC mg/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
	I. Aliphatic Narcotics								
1	Amytal, pentobarbital and seconal	Sedation and hypnosis	100-250 mg	Oral	1 hr	<1			
2	Barbital	Sedation and hypnosis	16-20 mg/kg/day	Oral	1-24 hr	5 12[1]			
3	Chloroform	Surgical anesthesia	1.5 vol. % in inspired air	Inhalation	About 5 min	15-20			
4	Cyclopropane	Surgical anesthesia	20-30 vol. % in inspired air	Inhalation	2-3 min	15			
5	Ethyl alcohol	Euphoria	About 30 ml 50% alcohol	Oral	15-30 min	30			
6		Hypnotic	About 100 ml, 50% alcohol	Oral	15-30 min	100			
7		Anesthetic (stupor)	About 300-400 ml 50% alcohol	Oral	15-30 min	300-400			
8		Generally fatal	Adults: 1000 ml, Children. 100-200 ml 50% alcohol	Oral	5-100 hr	500			
9	Ethyl chloride	Surgical anesthesia	3-4.5 vol. % in inspired air	Inhalation	2 min	20-30			
10	Ethylene	1st plane anesthesia	80-85 vol. % in inspired air	Inhalation	20 min	120-180			
11	Ethyl ether	Surgical anesthesia	6-10 vol. % in inspired air	Inhalation	15-25 min	50-130			
12	Methyl N-propyl ether (Metopryl)	Surgical anesthesia	2.5-3 vol. % in inspired air	Inhalation	10-15 min	30-60			
13	Nitrous oxide (Nitrogen monoxide)	1st plane anesthesia	85-92 vol. % in inspired air	Inhalation	2 min	23 vol. %			
14	Paraldehyde	Obstetrical amnesia and analgesia	30 ml in 60 ml olive oil	Rectal or nasal	0.5-16 hr[2]			11.8-24.4	
15	Phenobarbital	Sedation and hypnosis	5-10 mg/kg/day	Oral	1-24 hr	5 or less[3]			
16	Thiopental sodium (Sodium pentothal)	1st & 2nd plane anesthesia	35 mg/kg/hr	Intravenous	Immediate		1st plane 2 2nd plane 3		
17	Tribromethanol (Avertin)	Basal anesthesia	80-100 mg/kg	Rectal	30 min	6-9			
18	Vinyl Ether (Divinyl oxide, "Vinethene")	Surgical anesthesia	4 vol. % in inspired air	Inhalation	1-2 min	30-40			
	II. Bromides								
19	Sodium bromide or other alkaline bromides	Sedation	2-3 g/day	Oral	1 hr or more	16-50			
20		Antiepileptic	3-10 g/day	Oral	Several days		100 or more[4]		
	III Analgesics								
21	Isonipecaine (Demerol)	Analgesic	100 mg	Intramuscular	1.5-2 hr	0.125 in 0.5 hr and 0.05 after 2 hr			

/1/May produce unconsciousness /2/Peak level 2-4 hr. /3/Blood level over 7 mg/100 ml indicates overdosage.
/4/Bromoderma and other symptoms observed.

101. EFFECTIVE BLOOD LEVELS OF THERAPEUTIC AGENTS (Continued)

	Therapeutic Agent	Therapeutic Use	Dosage	Method of Admin.	Time after Admin.	Blood	Plasma	Serum	RBC
						mg/100ml	mg/100ml	mg/100ml	mg/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
22	Sodium salicylate	Acute rheumatic fever	5-15 g/day	Oral	24 hr or more		8-28	157-558 μg/ml	
	IV. Cardiac Drugs								
23	Digitoxin	Congestive heart failure	1.2-1.6 mg	Oral	About 6 hr			20μg/100 ml[5]	
24	Ouabain	Congestive heart failure	0.5 mg (divided)	Intravenous	About 1-2 hr			5μg/100 ml[5]	
25	Potassium acetate	In relation to digitalis glycosides	5 g	Oral	1 hr or more			20-27	
26	Procaine hydrochloride	Abolition of cardiac arrhythmias	200 mg	Intravenous	25 min	0.055-0.060			
27	Quinidine sulfate	Control of various cardiac arrhythmias	0.8 g	Oral	2-10 hr		0.08-0.27[6]		
	V. Hypotensive Agents								
28	Potassium thiocyanate	Hypertension	0.5 g/day	Oral	1-3 hr		8-10		
	VI. Skeletal Muscle Relaxants								
29	Myanesin or 3-(2'-Methylphenoxy) propane-1, 2-diol (spinal cord depressant)	Adjuvant to anesthetics, treatment of convulsive poisonings (particularly strychnine)	50 mg	Intravenous	Immediate		5		
30					20 min later		2.4		
31	d-Tubocurarine chloride (neuroeffector depressant)	Adjuvant to anesthetics, control of shock therapy in schizophrenia	0.2 mg/kg	Intravenous	3 min		0.4		
32					15 min		0.26		
33					30 min		0.1		
	VII Histamine and Antihistaminics								
34	beta-Dimethylaminoethyl benzhydryl ether hydrochloride (Benadryl)	Allergic reactions	400 mg	Oral	1-2 hr	0.5-1.8μg/ml			
35	Histamine phosphate	Stimulation of hydrochloric acid secretion	2 mg	Subcutaneous	30 min	>7.5μg/100 ml			
36	Pyridyl-benzyl-dimethyl-ethylene diamine hydrochloride (Tripellenamide or pyribenzamine)	Allergic reactions	400 mg	Oral	2-3 hr	0.4μg/ml			
	VIII Antianemics								
37	Ferric sodium citrate	Secondary anemia	0.75 g[7]	Oral	1 hr			0.15	
38					3 hr			0.25	
39					8 hr			18	
40					14 hr			<0.8	

/5/Calculated. /6/1-4 hr 1 g oral 0.2 - 0.43 mg/100 ml plasma /7/Insufficient therapeutic dosage.

101. EFFECTIVE BLOOD LEVELS OF THERAPEUTIC AGENTS (Continued)

	Therapeutic Agent	Therapeutic Use	Dosage	Method of Admin.	Time after Admin.	Blood mg/100ml	Plasma mg/100ml	Serum mg/100ml	RBC mg/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
41	Ferrous ammonium sulfate	Secondary anemia	0.75 g[7]	Oral	Same as (37-40E)			Similar to (37-40 H)	
	IX. Iodine and Anti-thyroid Substances								
42	Sodium iodide	Prevention of hypothyroidism	1.5 mg/day	Oral	2-4 wk	7 µg/100 ml			
43		Pre-operative treatment of thyrotoxicosis	15 mg/day	Oral	Several days	>19 µg/100 ml[8]			
44	Thiourea	Thyrotoxicosis	1-2 g	Oral	Variable	3-5			
45	2-Thiouracil	Thyrotoxicosis	0.8 g/day	Oral	Variable		0.3-0.5		
	X. Calcium Compounds								
46	Di-calcium phosphate	Calcium deficiency	0.8 g t.i.d. (with viosterol)	Oral	Several days	9-11			
	XI. Chemotherapeutic Agents (1) Antibiotics								
47	Aureomycin	Typhoid fever	100 mg	Intramuscular	24 hr	0.03-0.06 µg/ml			
48		Rocky Mountain spotted fever	300 mg	Oral	24 hr	0.03 µg/ml			
49		A. aerogenes, abscess pneumococcic pneumonia, and meningitis	700 mg	Oral	24 hr	0.03-0.1 µg/ml			
50	Chloramphenicol (Chloromycetin)	Tularemia and other conditions	15.5 g in four days	Oral	24 hr or more	20-30 µg/ml			
51	Penicillin	Infection with penicillin-susceptible organisms	100,000 units in 24 hr	Intravenous drip			0.13 units/ml		
52			200,000 units in 24 hr				0.22 units/ml		
53			400,000 units in 24 hr				0.42 units/ml		
54	Penicillin	Respiratory infections	30,000 units every 2-4 hr	Inhalation[9]	2-3 hr			0.11-0 22 units/ml	
55	Penicillin-aluminum hydroxide	Mild infections	100,000 units	Oral	1-10 hr		0.03-0.3 units/ml		
56	Penicillin (Beeswax-peanut oil mixture)	Usual indications	600,000 units	Intramuscular	12 hr		0.1-1.0 units/ml		
57	Penicillin (Crystalline) without caronamide	Severe infections	1,000,000 units	Rapid Intravenous	3 hr		2 units/ml		
58	Penicillin (Crystalline) with caronamide	Severe infections	1,000,000 units	Rapid intravenous	3 hr		10 units/ml		
59	Penicillin (Procaine penicillin G in oil)	Pneumonia	300,000 units	Intramuscular	9 hr		0 34-0.68 units/ml		
60	Streptomycin	Infections with streptomycin-susceptible bacteria	0.15 g every 3 hr	Intramuscular	3 hr	14 µg/ml[10]			

/7/Insufficient therapeutic dosage. /8/Calculated. /9/Through nebulizers. /10/16-20 µg/ml is usually more desirable.

101. EFFECTIVE BLOOD LEVELS OF THERAPEUTIC AGENTS (Continued)

	Therapeutic Agent	Therapeutic Use	Dosage	Method of Admin.	Time after Admin.	Blood	Plasma	Serum	RBC
						mg/100ml	mg/100ml	mg/100ml	mg/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
61	Terramycin hydrochloride	Acute pulmonary infections	750 mg or more	Oral	1-5 hr	0.7-5 0 μg/ml			
	(2) Anti-Malarials								
62	Chlorguanide hydrochloride	Suppression and termination of attacks during vivax or falciparum infection	50 mg b.i.d.	Oral	4 hr		50-100μg/1000 ml		
63	(Paludrine)		500 mg b i.d.				300-500 μg/1000 ml		
64	Chloroquine diphosphate	Suppression of malaria in man	1.24 g (divided within a day)	Oral	4 hr		90-160 μg/1000 ml		
65			Priming dose 1 2 g (within 6 hr)		6-8 hr		260μg/1000 ml		
66	Pamaquine naphthoate	Gametocidal effect of malaria organisms in man	0.02 g 5 times/day	Oral	1-2 hr		250μg/1000 ml		
67	Pentaquine monophosphate	Gametocidal effect	60 mg/day	Oral	2 hr		30-50μg/1000 ml		
68	Quinacrine hydrochloride (Atabrine)	Suppression of malaria in man	0.6 g/wk (divided)	Oral	1 wk			30-50μg/1000 ml	
69		Suppression of malaria in man	1.6 immediately	Oral	48 hr		81-245μg/1000 ml[11]		
70	Quinacrine	Severe malaria (ante mortem) or in gastrointestinal intolerance to quinacrine	1 g	Intravenous	Immediate		8-22		
71	Quinine salts	Human malaria, Class I (Decelerated increase in the parasitemia)	0 5 g once daily	Oral			< 0.2		
72		Class II (Marked depression of parasitemia with clinical remission)	1-2 g/day	Oral			0.2-0.4		
73		Class III (Complete disappearance of parasitemia, no clinical symptoms)	3 g/day	Oral			0.5-0 7		
	(3) Antimony Compounds								
74	Anthiomaline (Antimony lithium thiomalate)	Wuchereria bancrofti infection and kala azar	0 5 mg of Sb/kg	Intramuscular	1 hr		0.18μg/g		0.78μg/g
75			0 5 mg of Sb/kg	Intramuscular	24 hr		0 03μg/g		0.15μg/g
76	Monosodium antimony thioglycollate	Same as 74B	0 5 mg of Sb/kg	Intramuscular	1 hr		0.12μg/g		1.1μg/g
77					24 hr		0.07μg/g		0.35μg/g
78	Neostibosan (Ethylstibamine)	Same as 74B	2 0 mg of Sb/kg (initial)[12]	Intravenous	24 hr		0.7-0.9 μg/g		0.2-0.3 μg/g

/11/ Each gram of quinacrine administered by mouth raises the plasma level by 23μg/1000 ml, and there is a daily decrease of the plasma concentration by 10 per cent /12/ Total dose: 58-66 mg Sb/kg in 9-10 days.

101. EFFECTIVE BLOOD LEVELS OF THERAPEUTIC AGENTS (Continued)

	Therapeutic Agent	Therapeutic Use	Dosage	Method of Admin.	Time after Admin.	Blood	Plasma	Serum	RBC
						mg/100ml	mg/100ml	mg/100ml	mg/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
79	Solustibosan (Diethylaminoethanol salt of sodium antimony glyconate)	Same as 74B	3.0 mg of Sb / kg (initial)[13]	Intravenous	24 hr		0.4µg/g		0 6µg/g
	(4) <u>Aromatic Amidines</u>								
80	Stilbamidine	Trypanosomiasis, Kala azar, babesiasis, and multiple myeloma		Oral	30 min			40µg/ml	
81				Subcutaneous	1 hr			*20µg/ml*	
	(5) <u>Arsenicals</u>								
82	Arsphenamine	Syphilis (Intensive therapy)	31.7 mg/kg in 5 days t.i.d.	Intravenous	4-6 hr	0.5-0.7 mg/100 g			
83	Clorarsen (Dichlorophenarsine hydrochloride)	Syphilis	0.067 g/day	Intravenous	15 min		<0.05[14]		
84	Neoarsphenamine	Syphilis	0.1 g	Intravenous	15 min		0.2-0.38[14]		
85	Oxophenarsine hydrochloride (Mapharsen)	Syphilis	0.06 g	Intravenous	10 min		< 0 05[15]		
86		Syphilis (Intensive therapy)	0.84 g/day	Intravenous	5 days	17 µg/100 ml[14]			
87	Tryparsamide	Neurosyphilis, trypanosoma gambiense infection	2 g	Intravenous	24 hr		0.03-0.04 µg/ml[14]		
	(6) <u>Sulfonamides</u>								
88	*Sulfadiazine*	*Same as the* other sulfonamides, particularly effective against type B Friedlaender bacillus	*4 g initially* followed by 1 g every 4 hr	*Oral*	*6-12 hr*	*10-15*			
89	Sulfaguanidine	Prophylaxis in colonic surgery, intestinal antisepsis	0.01 g/kg initially, followed by 0 05 g/kg every 4 hr	Oral	Irregular	5			
90	Sulfamerazine	Same as other sulfonamides	3-4 g initially, followed by 1g every 8 hr	Oral	12-24 hr	10-15			
91	Sulfanilamide	Streptococcic, *meningococcic*, pneumococcic, staphylococcic infections, etc.	30-50 mg/*kg in* 24 hr[15]	Oral	12-24 hr	10-15			
92	Sulfapyridine	Same as 91 B (*seldom used*)	5 g	Oral	6-12 hr	4-6			
93	Sulfathiazole	Pneumococcic and gonococcic infections infections	4 g initially, followed by 0.5-1 g every 4 hr	Oral	4-8 hr	4-6			

/13/ Total dose 71-84mg Sb /kg in 8 or 9 days. /14/ Expressed as arsenic /15/ One-third of total dose should be given first day

101. EFFECTIVE BLOOD LEVELS OF THERAPEUTIC AGENTS (Concluded)

	Therapeutic Agent	Therapeutic Use	Dosage	Method of Admin.	Time after Admin.	Blood mg/100ml	Plasma mg/100ml	Serum mg/100ml	RBC mg/100ml
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
	XII Miscellaneous Chemotherapeutic Agents								
94	Para-aminobenzoic acid	Tsutsugamushi disease	8 g initially followed by 3 g every 2 hr	Oral	12-24 hr	100-150			
95	p-Chloroxylenol	Urogenital infections	1-2 g	Intramuscular	2 hr	1-3			
96	Suramin sodium (Germanin, Bayer 205)	African sleeping sickness	1 g	Intravenous	48 hr		3		
97					9 days		0.8		
	XIII. Vitamins								
98	Vitamin A	Hypovitaminosis A	10,000 or more units/day	Oral			90-130 I.U./100 ml		
99	Ascorbic acid	Scurvy; peptic ulcer	5 g/day	Oral	Variable		0.8-1.8		
100	Biotin			Oral		1.3-1.9 µg/100ml			
101	Carotene	Hypovitaminosis A (seldom used)	0.3 mg/day	Oral			100-220 µg/100ml		
102	Folic acid	Nontropical sprue	10-20 mg/day	Oral		3.5 µg/100 ml			
103	Inositol	Amyotrophic lateral sclerosis	1.5 g/day	Oral	3 wk		0.75		
104	Nicotinic acid	Clinical pellagra	Up to 500 mg/day	Oral		0.8 µg/100 ml			
105	Pantothenic acid			Oral		30-45 µg/100 ml			
106	Riboflavin	Cheilosis, etc.	5-10 mg/day	Oral		40			
107	Tocopherol	Habitual abortion, menstrual disorders, etc.	0.25-8 ml of wheat germ oil/day	Oral	Variable		1.2 or more		
	XIV. Hormones								
108	Estrone sulfate (Conjugated estrogens)	Cancer of prostate, etc.	100-400 mg[16]	Intravenous	Immediately			18-48 µg/ml	
109					2 hr			2-18.4 µg/ml	
110					4 hr			0-18 µg/ml	
111					8 hr			0-7.8 µg/ml	
112					24 hr			0.0 µg/ml	
113	ACTH	Acute rheumatic fever, rheumatoid arthritis	100-330 mg[16]	Intravenous	2 hr		10-100 µg/ml		
114	Thyroxin	Myxedema	0.5 mg	Oral	Variable	12-13 µg/100 ml of hormonal iodine			
	XV. Antimitotic Agents								
115	Urethane	Chronic myeloid leukemia and Hodgkin's disease	1 g 6 times/day	Oral	22 hr	10-38			

(16) Experimental human medication

BIBLIOGRAPHY

Bibliography

The system for presenting bibliographic references used here has been adapted from one in common use in geographic atlases. An item in a table is identified by two coordinates, a letter designating the column, and a number the row, in which the item appears. In a typical instance in the bibliography, the coordinates of an item are followed, in the column to the right, by a number accompanied by a small letter. The number refers to the bibliographic source, the letter to the person contributing the item. If an item in a table is based on another item from another part of the same table, the coordinates of the latter are given as source, enclosed in parentheses.

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The following abbreviations are used: Fn = footnote; Calc. fr. = calculated from; Av. = average.

1. BLOOD SPECIFIC GRAVITY

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
Fn 2	d, 10	12, 13 A-D* & Fn 6, 7	3	28 A-D*	2
1-3 ABCD & Fn 1	7b	12, 13 E	12	28 E	11
1-3 E	9b	14-19 ABCD* & Fn 8	13a	29, 30 A-E	5
4, 5 A-E	5	14-19 E	7	31 A-D* & Fn 12	2
6, 7 A-D	8	20 A-D* & Fn 9	6c	31 E	11
6, 7 E	12	21 A-D* & Fn 10	2	32-36 ABCD* & Fn 13	13a
8, 9 A-E* & Fn 3, 4, 5	1	21 E	11	32-36 E	7
10, 11 A-F	5	22-27 ABCD* & Fn 11	13a	37 A-E* & Fn 9, 14	4c
		22-27 E	7	38, 39 A-E	5

*Values in literature converted to standard reference temperature (as indicated in column D) by V P Dole

Contributors (a) Cronkite, E P (b) Dole, V P (c) Holman, H H (d) Van Slyke D D

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2. RELATIVE VISCOSITIES, BLOOD, PLASMA, SERUM

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
Fn 1-3	a	5,6 A-C	7a	10 A-C	7a
1 A-C	1a, 2a	6 D* E*	7a, 4	10 D* E*	7a, 4
1 D* E*	3a, 4	7,8 A-C	7a	11 A-C E & Fn 4	8a
2 A-C	5a	8 E*	7a, 4	12 A-C & Fn 4	9a
3 A-C	5a	9 A-C	7a		
4 A-C	6a	9 E*	7a, 4		

* Calculated values

Contributors. (a) Pappenheimer, J.R. (b) Green, H.D. contributed to organization of table.

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3 BLOOD MISCELLANEOUS PHYSICAL PROPERTIES

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-16 AB & Fn 1	1a	26-28 AB	5	30-32 ABC & Fn 3	5
17,18 A-C	2	29 A C & Fn 2	2	33-35 AB	3b
19-25 AB	4				

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4 BLOOD COLLOIDS, OSMOTIC PRESSURE

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1,2 A-D & Fn 1	4b	22-24 ABCD	2a, 5a	31 A-D	4a
3 A-D	3a, 6a	25 A-D	4b	32, 33 A-D	2a, 5a
4,5 A-D	4b	26 A-D	2a, 5a	34, 35 A-D	1a, 6a
6-10 ABCD & Fn 3	2a, 5a, 7c	27 A-D	4b		
11-21 ABCD	4b	28-30 ABCD	2a, 5a		

Contributors (a) Hill, R M. (b) Keys, A (c) Walford, L A contributed common and accepted scientific names of elasmobranchs (6-10B) and of fish (22-33B)

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5. ERYTHROCYTE SEDIMENTATION RATE, TIME

Fn 1,2	a	19 A CD	8	32 AB D & Fn 5	7
1,2 A CD	13ab	20 A-D & Fn 4	8	33 A-D	6
3,4 A CD	15a	21 AB D	10	34 AB D	10
5,6 A CD	9a	22,23 A-D	6	35,36 AB D	1
7,8 A CD	14a	24 A-D	6	37 A-D	6
9,10 A CD	11a	25 A-D	4	38 AB D	10
11,12 A CD	12a	26 AB D	10	39 A-D	6
13,14 A-D & Fn 3	9a	27 AB D	3	40 AB D	10
15 A-D	6	28 A-D	6	41 A-D	6
16 AB D	10	29 AB D	10	42 A CD & Fn 6	16a
17 A-D	6	30 A-D	6	43 AB D	2
18 AB D	10	31 AB D	10	44 A CD	5

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6. ERYTHROCYTE FRAGILITY MAN

Data C and I	[illegible]
1 A C-	[illegible]
2 A C-	[illegible]
3 A-H	[illegible]

Contributors. (a) Hendry, E. B. (b) Riser, W H., Jr

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7. ERYTHROCYTE FRAGILITY: VERTEBRATES OTHER THAN MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A C	11a	7 A-C	6a	14 A-C	1a
2 A C	7a	8,9 A-C	1a	15 A-C	8
3 A-C	3a	10 A-C	2a	16 A-C	9
4 A-C	4a	11 A C	11a	17,18,19 A-C	1a
5 A-C	11a	12 A-C	6a	20 A-C	10
6 A-C	1a	13 A C	11a	21,22 A-C	5a

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8. BLOOD COAGULATION. Theory of P. A. Owren (1952)

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Fn 1	1a,2a
Fn 2	3a,4a,5a
Fn 3,4,5	6a,7a
Fn 6	1a,2a

Contributor Owren, P.A

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Fn 1	1a
Fn 2	2a,3a
Fn 3	1a
Fn 4	4a
Fn 5	5a

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Footnotes	Contributors and References	Footnotes	Contributors and References
Fn 1	2a, 6a	Fn 4	1a, 2a
Fn 2	2a	Fn 5	2a
Fn 3	1a	Fn 6	3a, 4a, 5a

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Footnotes	Contributors and References	Footnotes	Contributors and References
Fn 1	1a	Fn 5	
Fn 2	2a	Fn 6	5a, 6a, 7a
Fn 3	3a	Fn 7	8a
Fn 4	4a	Fn 1-7	9a

Contributor. (a) Stefanini, M.

References (1) Quick, A. J., Shanberge, J. N., and Stefanini, M., Am. J. Med. Sci. 217:198, 1950. (2) Stefanini, M., and Crosby, W. H., Proc. Soc. Exp. Biol. Med. 74:370, 1950. (3) Stefanini, M., Acta Med. Scand. (in press) (4) Stefanini, M., and Crosby, W. H., Am. J. Clin. Path. 20:1026, 1950. (5) Quick, A. J., and Stefanini, M., Proc. Soc. Exp. Biol. Med. 67:111, 1948. (6) Stefanini, M., Experientia 5:330, 1949. (7) Wilson, S. J., Arch. Int. Med. 69:647, 1942. (8) Stefanini, M., and Zannos, L., Fed. Proc. 10:132, 1951. (9) Stefanini, M., Blood 6:84, 1951.

12. BLOOD COAGULATION Theory of L. M. Tocantins (1952)

Contributor (a) Tocantins, L. M.

References (1) Tocantins, L. M.: Coagulation of Circulating and Shed Blood Results from Disruption of the Dynamic Equilibrium Existing between Anticoagulant and Coagulant Components of the Blood Responsible for the Maintenance of its Fluidity and Coagulability, Surg. Clin. N. Amer., 1835, Dec. 1949. (2) Tocantins, L. M., Am. J. Physiol. 139:265, 1943. (3) Tocantins, L. M., Proc. Soc. Exp. Biol. Med. 55:291, 1944. (4) Tocantins, L. M., Fed. Proc. 1 March, 1942. (5) Tocantins, L. M., Am. J. Physiol. 143:67, 1946. (6) Tocantins, L. M. Blood 1:156, 1946.

13. BLOOD COAGULATION TIME: MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A-E	1a	11 A-E	2a	16 AB DE	9a
2 A-D	1c	12 A DE	4b	17 AB	10
3 A-E	2a	13 AB DE	7a	17 C-E	10a
4,5 A-E	3a	14 AB DE	6a	18 A-E	11
6-9 AB DE	4b	15 AB D	8	Fn 3	8
10 A-E	5a				

Contributors: (a) Diggs, L.W. (b) Lewis, J.H (c) White, P.D.

References: (1) Lee, R. I., and White, P.D., Am. J. Med. Sci. 145 495, 1913. (2) Tocantins, L. M., Med. Clin. N. Amer. 30.1361, 1946. (3) Aggeler, P.M., Howard, J., and Lucia, S.P., Blood 1:472, 1946. (4) Lewis, J.H., unpublished data. (5) Copley, A.L., and Houlihan, Science, Dec. 1, 1944. (6) Gibbs, O.S., Quart. J. Med. 17:312, 1934. (7) Diggs, L.W., unpublished data. (8) Wintrobe, M. M., "Clinical Hematology." p. 205, 207, Lea & Febiger, Phila., 1946. (9) Quick, A. J., "The Hemorrhagic Diseases and the Physiology of Hemostasis." C. C. Thomas, Springfield, Ill., 1942. (10) Cheney, G., Am. J. Med. Sci. 203 325, 1942. (11) Nygaard, K. K., "Hemorrhagic Diseases." C. V. Mosby Co., St. Louis, Mo., 1941.

14. HEPARIN-RETARDED COAGULATION TIME: MAN

1,2 A-E	1a	10 A-C	3
3-9 ABC	2	10 EF	3b
3-9 DEF	2b		

Contributors: (a) de Takats, G. (b) Diggs, L.W.

References: (1) de Takats, G., Angiology 1:317, 1950. (2) Waugh, T.R., and Ruddick, D.W., Canad. Med. J. 50.547 1944 (3) Tuft, H.S., and Rosenfield, R.E., Am. J. Clin. Path. 17:862, 1947

15 HEPARIN TOLERANCE MAN

Data Coordinates and Footnotes	Contributors and References
1 AB	1
1 DE	1a
2 A-E	2

Contributor. (a) Diggs, L.W.

References: (1) de Takats, G., Surg Gyn. Obst. 77:31, 1943. (2) Hagedorn, A, and Barker, N W, Am. Heart 35:603, 1948.

16. SKIN BLEEDING TIME. MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A-E	1,2b	5 A-E	3a, 7b
2 A-E	3a	6 A-E	6a, 7b
3 A-E	4ab	7 A-E	8
4 A-E	5a		

Contributors (a) Diggs, L.W. (b) Lewis, J.H.

References. (1) Wintrobe, M.M., "Clinical Hematology" p 210. Lea & Febiger, Phila. 1946 (2) Duke, W.W., J. Am. Med Assoc. 55 1185, 1910. (3) Tocantins, L.M., Med Clin. N. Amer. 130 1361, 1946. (4) Copley, A.L and Lalich, J.J., J. Clin. Invest. 21:145, 1942 (5) Aggeler, P.M., Howard, J., and Lucia, S.P., Blood 1 472, 1946. (6) Diggs, L.W., unpublished data. (7) Ivy, A.C., Shapiro, P.F., and Melnick P., Surg Gyn. Obst. 60 781, 1935. (8) Ivy, A.C., Nelson, D., and Bucher, G.R., J. Lab Clin. Med. 26 1812, 1941.

17. BLOOD CLOT RETRACTION, VOLUME, TIME MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A-D	1a	4 CD	4a
2 A CD	4a	5 A-D	3a
3 A-D	2a		

Contributor. (a) Diggs, L.W.

References (1) Aggeler, P M, Howard, J., and Lucia, S P, Blood 1 472, 1946 (2) Tocantins, L.M, Med. Clin. of N. Amer 130 1361, 1946. (3) Hirschboeck, J.S., J Lab. Clin. Med. 33 347, 1948. (4) Diggs, L.W., unpublished data.

18. PLASMA PROTHROMBIN TIME MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 AB	1	5 A-E	8	10 AB DE	2
1 C EF	1b	5 F	8b	10 C F	2b
2 AB	3	6 AB DE	4	11 AB	7
2 C EF	3b	6 C F	4b	11 C EF	7b
3 AB DE	5	7 AB DE	8	12 AB E	6
3 C F	5b	7 C E	8b	12 C F	6ab
4 A-F	9	8, 9 A-F	9		

Contributors (a) Diggs, L W (b) Owen, C A.

References (1) Quick, A J, Am J. Clin Path 15 560, 1945 (2) Kato, K. and Poncher, H G, J Am Med. Assoc 114 749, 1940 (3) Magath, T B. and Hurn, M., Am J Clin Path, Tech Suppl. 3 187 1939 (4) Page, R.C. and Russell, H.K., J Lab Clin. Med 26 1366, 1941 (5) Witts, L.J. and Hobson, F.C G., Brit. Med J 1 575, 1942 (6) Ziffren, S.E., Owen, C A, Hoffman G R, and Smith, H P, Am J Clin. Path 10 13, 1940. (7) Karabin, J.E., and Anderson, E R, J. Lab Clin Med 26 723, 1941 (8) Shapiro, S, Sherwin, B, Redish, M, and Campbell, H A, Proc Soc. Exp Biol Med 50 85, 1942 (9) Aggeler, P M, Howard, J, Lucia, S P, Clark, W., and Astaff, A, Blood 1 220, 1946

19. PLASMA PROTHROMBIN, RELATIVE LEVELS VERTEBRATES

Data Coordinates and Footnotes	Contributors and References
1-11 AB Fn 4	Calc. from lab 1

Contributors: (a) Diggs, L.W. (b) Warner, E.D.

References: (1) Warner, E.D., Brinkhous, K.M., and Smith, H.P., Am. J. Physiol. 125 296, 1939.

20. PLASMA ACCELERATOR GLOBULIN, RELATIVE LEVELS: VERTEBRATES

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1,3-6,8B 1-9 C	1c Calc fr. 2abc	Fn 3 Fn 4	1c 4c	Fn 5	2 abc, 3c

Contributors (a) Owen, C.A. (b) Seegers, W.H. (c) Stefanini, M.

References: (1) Quick, A.J., and Stefanini, M, J. Lab Clin Med. 33 819, 1948 (2) Murphy, R.C., and Seegers, W.H., Am. J. Physiol 154 134, 1948 (3) Ware, A.G., and Seegers, W.H., Am. J. Physiol. 152:567, 1948. (4) Ware, A.G., and Seegers, W.H., J. Biol. Chem. 172:699, 1948

21. BLOOD PLATELET COUNT MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A 2,3 AB 4,5 A 4,5 B 6 AB	1a 1c 2a 2,3 4a	7 AB 8 AB 9 AB 10 AB 11 AB	5cd 6ab 7cd 8c 9c

Contributors (a) Brecher, G. (b) Cronkite, E.P. (c) Diggs, L.W. (d) Lewis, J.H

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Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A-D	7ab	10 A-D	12ab	19 A-D	3ab
2 A-D	11ab	& Fn 5		& Fn 6	
3,5,9 A-D	1ab	11 A-D	20ab	21 A-D	22ab
4 A-D	21ab	12 A-D	19ab	22 A-D	17ab,c
6 A-D	15ab	13 A-D	19ab	23 A-D	16ab
7 A-D	18ab	14 A-D	8ab	24 A-D	13ab
& Fn 1,2,3		15 A-D	10ab	25 A-D	5ab
8,20 A-D	2ab	16 A-D	4ab	26 A-D	14ab
& Fn 4,7		17 A-D	9ab	27 A-D	6ab
		18 A-D	8ab		

Contributors (a) Tocantins, L.M. (b) Jaques, L. B (c) Nice, L.B.

References [illegible] Paris, [illegible] and [illegible] he [illegible] iss. [illegible] er. [illegible] am. [illegible] T E., [illegible] n, K.B., [illegible] Biol. [illegible] 1938 [illegible]

Note: *quoted from (19)
**quoted from Gardner, M.V., J. Franklin Inst 243 77, 172, 1947.

23. CAPILLARY FRAGILITY MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A-E	6	11 ABC E	7	14 A-C	4
2-7 ABCDE	2	12 A-D	5a	15 ABC E	1
8-10 ABC E	3b	13 ABC E	5a		

Contributor. (a) Diggs, L. W (b) Frontali, G.

References (1) Wright, I. S and Lilienfeld, A., Arch Int Med 57 241, 1936. (2) Lundquist, N., Acta paediat Supp 2, 20 1, 1937 (3) Frontali, G., "Capillari nel Bambino " edit L. Cappelli, Bologna, 1927 (4) Gothlin, G F, Acta paediat, 20-71, 1937 (5) Diggs, L W, unpublished data (6) Dalldorf, G., Am. J Dis Child. 46,794, 1933 (7) Aggeler, P. M, Howard, J and Lucia, S P, Blood 1 472, 1946

24. THE ABO SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES

Data contributed by Allen, F.H., Wiener, A.S , and Levine, P. Frequencies for General Blood Groups from Snyder, L. H., 20,000 Americans, cited by Boyd, W.C., in Tabulae Biologica 17 Part 2, 1939. Frequencies for Subgroups from Wiener's tests on 1077 whites (N.Y.C.).

25. THE DISTRIBUTION OF THE ABO BLOOD GROUPS IN VARIOUS POPULATIONS

Data contributed by Levine, P., Wiener, A.S., and Levine, V.E. Selections from Weiner, A.S., "Blood Groups and Transfusion." 3rd ed., 1943, C.C Thomas, Springfield, Ill., from Boyd, W.C. Tabulae Biologica 17.Part 2, 1939, and from Boyd, W.C., "Genetics and the Races of Man." p.223, Little, Brown & Co., Boston, 1950.

26. HEREDITY OF THE ABO BLOOD GROUPS
Application in Disputed Paternity

Modified from Levine, P.

27. HEREDITY OF THE ABO BLOOD SUBGROUPS
Application in Disputed Paternity

Data contributed by Riser, W.H., modified from DeGowin, E.L., Hardin, R.C., Alsever, J.B., "Blood Transfusion." W.B. Saunders Co., 1949

28 THE Rh-Hr (CDE-cde) SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES

. Data contributed by Wiener, A.S., Levine, P., Allen, F.H., and Haberman, S Frequencies for U.S A. whites (N.Y.C.) from Wiener, A.S. Frequencies for British whites from Race, R R., et al., 2000 English bloods, in Blood 3·689, 1948. Frequencies in footnote /3/ from Hill, J M., Am J. Clin. Path. 17 No 6, 1947.

29. THE DISTRIBUTION OF THE Rh-Hr BLOOD TYPES IN VARIOUS POPULATIONS

Data contributed by Levine, P , and Wiener, A.S. Selections from Wiener, A S , Am J. Clin. Path 16 477, 1946.

30. THE MNS SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES

Data contributed by Allen, F.H., Wiener, A.S., and Levine, P. Frequencies for 340 English bloods, Pickles, M.M., Nature 162 66, 1948.

31. THE DISTRIBUTION OF THE MN BLOOD FACTORS IN VARIOUS POPULATIONS

Data contributed by Levine, P., and Wiener, A.S. Frequencies from Wiener, A.S, "Blood Groups and Transfusion." 3rd ed, 1943, except for Eskimos contributed by Levine, V.E.

32. HEREDITY OF THE MN BLOOD FACTORS.
Application in Disputed Paternity

Modified from Levine, P.

33. THE K ("KELL-CELLANO") SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES

Data contributed by Allen, F.H., and Levine, P. Frequencies from Levine, P. et al., Blood 4 No 7, 869, July, 1949 for U.S.A. whites, and from Sanger, R., et al, Rev. d'hemat. 4:32, 1949, for English whites.

34. THE Le ("LEWIS") SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES

Data contributed by Allen, F.H. Frequencies from Sanger, R., 132 Harvard medical students and Children's Hospital personnel, 1948. Terminology from Race, R R., et al., Brit. J. Exp. Path 30:73, 1949.

35. THE Lu ("LUTHERAN") SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES

Data contributed by Haberman, S., and Allen, F H. Nomenclature from Nature 163 580, 1949. Frequencies for 582 English bloods, Callender, S T, and Race, R.R., Ann Eugen. 13:102, 1946. Frequencies in footnote /1/ for 110 U.S. (Tex) bloods, Hill, J.M, Haberman, S., and Guy, R, unpublished data

36. THE P SYSTEM OF BLOOD FACTORS AND THEIR FREQUENCIES

Data contributed by Allen, F.H. Frequencies from Sanger, R., 132 Harvard medical students and Children's Hospital personnel, 1948.

37 BLOOD ERYTHROCYTE VALUES MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-3 ABC	17a,9j	17 A-C & Fn 7	g,9j	35 AB	17a,9j
4-7 ABC & Fn 1,2	9j,11j	18 AB	7k	36,37 A-C	12i
8,9 A-C	17a,d,6o,9j	19-21 ABC	9j	38,39 A-C	13i
Fn 4	9j	Fn 8	7k	40,41 A-C	14i
10-12 ABC	17a,9j	22 A-C & Fn 9	j,8c	42,43 A-C	15m
13 A-C & Fn 5	17a,10j	23 A-C & Fn 10	8cn	44,45 A-C	16m
14 A-C	7k	24-26 ABC	9j	46 A-C	5b
15 A-C & Fn 6	17a,9j	27 A-C & Fn 11	3b,9j,18	47,48 AB & Fn 14	1c
16 AB	7k	28-33 ABC & Fn 12	6h	49 A-C	2f
		34 A-C	9j	50-52 AB & Fn 15	4e,19b
				53-65 AB	17a,9j,19b

Contributors: (a) Bethell, F H. (b) Collier, H B. (c) Dole, V.P. (d) Drabkin, D.L. (e) Ferguson, J.H. (f) Gram, H C. (g) Guest, G.M. (h) Heath, C.W. (i) Hirschboeck, J.S. (j) Osgood, E.E. (k) Ponder, E. (m) Riser, W.H., Jr (n) Van Slyke, D.D. (o) Wintrobe, M.M.

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38 BLOOD ERYTHROCYTE, HEMATOCRIT, HEMOGLOBIN AND THROMBOCYTE VALUES, BIRTH TO MATURITY MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
*1-18 BC	7bi,8bi,d,14e,15e,1f,2j	20 G	Calc fr 9g,(20F)x 10/(20B)	1-18 K	Calc fr(1-18H) x 100/(1-18F)
20-22 BC	9g	21 G	Calc fr 9g,(21F)x 10/(21B)	20-22 HI	9g
1,3-12 DE	4h	22 G	Calc.fr 9g,(22F)x 10/(22B)	20-22 J	9g
22 DE	10g	1-18 HI	d,14e,15e,1f,3f,5f,2j	20-22 K	9g,16a
*1-18 F	d,14e,15e,2j	1-18 J	Calc fr(1-18H) x 10/(1-18B)	*1,3-12 LM	1f
20-22 F	9g			22 LM	6,11c,12
*1-18 G	d,2j			Fn 4	13
				Fn 7	7bi,8bi

*Note These values are smoothed means and sample ranges from plotted curves based on averages of the data referred to.

Contributors: (a) Bethell, F.H (b) DeMarsh, Q B. (c) Diggs, L W (d) Glaser, K (e) Guest, G.M. (f) Mayerson, H.S (g) Osgood, E.E. (h) Washburn, A.H (i) Windle, W F (j) Wintrobe, M M.

References: (1) Merritt, K.K , and Davidson, L.T , Am J. Dis Child 46 991, 1000, 1001, 1008, 1933 (2) Wintrobe, M.M., "Clinical Hematology " 2nd ed., p 73, Lea & Febiger, Philadelphia, 1946 (3) Williamson quoted by Merritt, K.K., and Davidson, L.T , Am. J. Dis Child 46 991, 1933 (4) Washburn, A H , Am J Dis Child. 62 530, 1941 (5) Elvehjem, C.A , et al , Am J Dis. Child. 46 105, 1933 (6) Rees, H M., and Ecker, E E , J Am Med Assoc 80.621, 1923. (7) DeMarsh, Q B., Alt, H L , Windle, W.F , and Hillis, D.S , J Am Med Assoc 116.2568, 1941 (8) DeMarsh, Q B., Alt, H L , Windle, W F., Am J Dis. Child 75 860, 1948 (9) Osgood, E E , Arch Int Med.

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(Continued from preceding page)

56 849, 1935. (10) Osgood, E.E., et al., J. Lab. Clin. Med. 19 1129, 1934. (11) Aggeler, P.M and Lucia, S.P., "Hemo[illegible]
P.M., [illegible]
3rd ed [illegible]
G.M., [illegible]
F.H., [illegible]
1948

39. ERYTHROCYTE AND HEMOGLOBIN VALUES AT OR NEAR SEA LEVEL MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 C-E	1a	7 C-E	7a	13 C-E	13a
2 C-E	2a	8 C-E	8a	14 C-E	14a
3 C-E	3a	9 C-E	9a	15 C-E	15a
4 C-E	4a	10 C-E	10a	16 C-E	16a
5 C-E	5a	11 C-E	11a	17 C-E	17a
6 C-E	6a	12 C-E	12a	18 C-E	18a

Contributors (a) Dill, D.B.

References: (1) Osgood, E.E., Arch Int. Med. 37 685, 1926. (2) Osgood, E E., Arch Int. Med 56 849, 1935 (3) Wintrobe, M.M , and Miller, M W , Arch Int Med. 43 96, 1929 (4) Foster, F.C., and Johnson, J.R , Proc. Soc. Exp Biol, Med. 28 929, 1931. (5) Walters, O.S., J. Lab. Clin Med. 19 851, 1934 (6) Sachs, A., Levine, V.E., and [illegible] and Stoker, R., Folia haemat 58 333, 1937. [illegible], Compt rend Soc biol 108 133, 1931. [illegible]) Heilmeyer, L , and Hansold, L , Arch [illegible] 1928. (13) Hamre, C J , and Au, M H., J. [illegible] R., Indian J Med Res. 23 305, 1935. (15) Sokhey, S S., Gokhale, S.K., Malandkar, M A., and Bilimoria, H S , Indian J Med Res 25 505, 1937 (16) Jervell, O , and Waaler, J.H M., Norsk mag. laegevid 95 1141, 1934. (17) Hurtado, A , Pons M J , and Merino, C., "La Anemia de la enfermedad de Carrion " Librerie and Imprenta Gil, Lima, Peru, 1938 (18) Hurtado, A , Merino, C , and Delgado, E., Arch. Int Med 75 284 1945

40 ERYTHROCYTE AND HEMOGLOBIN VALUES AT ALTITUDE MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 C-F	1a	7 C-F	7a	13 C-F	10a
2 C-F	2a	8 C-F	8a	14 C-F	9a
3 C-F	3a	9 C-F	9a	15 C-F	12a
4 C-F	4a	10 C-F	9a	16 C-F	9a
5 C-F	5a	11 C-F	10a	17 C-F	9a
6 C-F	6a	12 C-F	11a	18 C-F	13a

Contributors (a) Dill, D.B

References [illegible] and Fonio, O A , Rev Soc argent biol. 20 581, [illegible] 1936 (4) Burgi, Kuno, Schweiz med Wschr, [illegible] nt. Med. 58 136, 1936 (6) Laknaitzky, I , Quart. J [illegible] 73 779, 1926 (8) Gill J.R , and Terán, I [illegible] 36 (10) Hurtado A Merino, C , and Delgado [illegible] ol 2 431 1950 (12) Talbott, J.H., and Dill, D. [illegible] iol 44 256, 1941

41. BLOOD ERYTHROCYTE (RBC) VALUES IN PREGNANCY AND POSTPARTUM MAN

Data contributed by Bethell, F.H., from Bethell, F H , Gardiner, S.H and MacKinnon, F. Ann Int Med 13 91, 1939.

42. BLOOD ERYTHROCYTIC VALUES: MAMMALS, LABORATORY

Data Coordinates	Contributors and References
Cat 1B	Av. of means from 4,8,15, 34,36,44,46,49,50,82,94,95, 115,128,129,147,182,198, 199,200,201,230,235
1C	Av. of ranges from 34,36, 49,82,95,115,188,199,201
1D	116,119
1F	Av. of means from 9,13,15, 82,93,94,115,147,148,183, 202,203,236
1G	Av. of ranges from 9,15,94, 203,236
1H	129
1I	c
1J	129
1K	Calc. from 129
1L	Av. of means from 129,50, 201,225,230,248
1M	Calc. from 129
1N	Calc. from (1L)x100/(1J)
1O	c
1P	Calc. from (1L)x10/(1B)
1Q	Range interval fr. c
Dog 2B	Av. of means from 2,6,7, 18,20,24,25,26,27,28,29,32, 34,35,37,44,47,49,51,52,53, 54,55,57,70,82,83,94,96,97, 110,115,123,124,125,126, 128,130,131,132,133,134, 135,136,137,149 through 161,174,175,176,179,182, 184,185,186,190,191,192c, 200,204,205,206,207,208, 227,231,232,235,237,238, 239,240,241,242,246,249, 251
2C	Av. of ranges from 2,6,18, 20,25,28,29,32,34,35,37,44, 49,51,52,53,54,55,70,82,83, 96,97,110,123,124,125,126, 128,131,132,133,135,136, 149,152,154,157,158,159, 174,175,179,182,184,185, 186,190,192,204,206,207, 208,231,232,238,239,240, 246
2D	Av. of means from 116,119, 192d
2E	192d
2F	Av. of means from 13,44, 53,71,72,82,93,94,108,115, 137,138,148,162,183,202, 203,204,209,226,233,243
2G	Av of ranges from 44, 53, 72, 94, 115, 138, 202, 203, 209
2H	Av. of means from 7,27 137, 160, 242
2I	Range interval fr 7,27,137 160, 242
2J	Av. of means from 7,a,21a, 22a, 27, 66, 84a, 85, 137, 139, 160, 193, 242
2K	Av. of ranges from 7, 242
2L	Av. of means from 7,27,57, 137, 160,161,192d, 242
2M	Av. of ranges from 27,192d
2N	Calc. from (2L)x100/(2J)
2O	Av. of ranges from 7,27, 137,160,242
2P	Calc. from (2L)x10/(2B)
2Q	Av. of ranges from 7,27, 137,160,161,242
Guinea Pig 3B	Av. of means from 12,15, 23,33,34,38,42,44,56,73,82, 86,87,88,94,98,115,122,149, 153,156,163,173,177,178, 210,211,212,232,244
3C	Av. of ranges from 12,23, 33,34,38,82,86,87,88,115, 122,149,156,178,210,232
3D	Av. of means from 3,10,12, 87,88,211
3E	Av. of ranges from 12,87,88
3F	Av. of means from 15,33, 44,71,82,93,94
3G	c
3H	Av. of means from 56,244
3I	c
3J	Av. of means from 56,87, 117,193,244
3K	87
3L	Av. of means from 56,87, 212,244
3M	b
3N	Calc. from (3L)x100/(3J)
3O	Range interval fr. c
3P	Calc. from (3L)x10/(3B)
3Q	Range interval fr. c
Mouse 4B	Av. of means from 45,56, 58,74,81,82,111,115,118, 141,142,153,187,213,244
4C	Av. of ranges from 74,75, 115
4D	116,119
4F	Av. of means from 82,202
4H	Av. of means from 56,187, 244
4I	c
4J	Av of means from 56,187, 193
4L	Av. of means from 56,58, 79,80,89,99,214,111,215
4M	Calc. from 99
4N	Calc. from (4L)x100/(4J)
4O	Range interval fr. c
4P	Calc. from (4L)x10/(4B)
4Q	Range interval fr. c
Rabbit 5B	Av. of means from 1,5,14, 15,16,17,19,20,28,29,30,31, 34,39,40,43,51,52,58,59,60, 61,62,63,67,68,76,77,78,82, 86,90,91,97,100,101,102, 103,104,109,112,113,114, 120,121,132,133,134,140, 143,144,151,153,156,165, 166,167,168,169,170,171, 173,175,177,179,180,181, 188,182,191,194,195,196, 204,207,216,217,218,219, 220,221,222,227,228,233, 232,235,241,242,252
5C	Av. of ranges from 1,5,16, 17,19,20,28,29,30,31,43,51, 52,59,60,61,62,67,76,78,82, 86,90,91,97,101,102,103,109, 113,114,120,121,132,133, 140,143,168,169,170,171, 175,179,180,188,195,204, 207,216,217,218,221,233,252
5D	Av. of means from 92,196, 221
5E	221
5F	189
5G	c
5H	Av. of means from 189,242
5I	c
5J	Av. of means from 43,104, 196,220,242
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5L	Av. of means from 40,58, 91,104,220,242
5M	Calc. from 242
5N	Calc. from (5L)x100/(5J)
5O	Range interval fr. c
5P	Calc. from (5L)x10/(5B)
5Q	c
Rat 6B	Av. of means from 41,45, 48,58,105,106,127,146,197, 229,245,250,254
6C	Av. of ranges from 105, 146,250
6D	Av. of means from 27,45, 48,223,224,229,255,256
6E	234
6F	189
6G	c
6H	242
6I	c
6J	Av. of means from 11,48, 65,69,80,107,117,127,172, 242,253
6K	242
6L	Av of means from 11,45, 48,58,99,106,172,197,229, 245
6M	Calc from 172
6N	Calc from (6L)x100/(6J)
6O	c
6P	Calc. from (6L)x10/(6B)
6Q	Range interval fr. c

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Note
* = quoted by (225)
** = quoted by (201)
*** = quoted by (247)
@ = quoted by (64)
= quoted by (80)

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43. HEMATOCRIT VALUES AND HEMOGLOBIN CONCENTRATIONS OF BLOOD. VERTEBRATES

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 B D	39d	7 F	Calc. from (7D x 100/7B)	13 B	1, 3, 12
1 F	39d, 40b	8 B	Av. of 1, 12-18	13 D	1, 34
2 B D	1	8 C	Calc. from 13	13 F	Calc. from (13D x 100/13B)
2 F	Calc. from (2D x 100/2B)	8 D	Av. of 14-24	14 B	3, 12
3 B	2, 3, 4	8 E	17	14 D	35
3 C	Calc. from 4	8 F	Calc. from (8D x 100/8B)	14 F	Calc. from (14D x 100/14B)
3 D	Av. of 2, 5, 6, 7	9 B	Av. of c, 3, 12, 25, 26	15 B	3, 12
3 E	Calc. from 2	9 C	Calc. from c	15 D	1
3 F	Calc. from (3D x 100/3B)	9 D	Av of c, 25-27	15 F	Calc. from (15D x 100/15B)
4 B	c	9 E	Calc. from c	16 B-F	36a
4 C	Calc. from c	9 F	Calc. from (9D x 100/9B)	17 B D	1, 37
4 D	Av. of c, 1, 8	10 B	Av. of 3, 11, 28	17 F	Calc. from (17D x 100/17B)
4 E	Calc. from c	10 C-E	Calc. from 11	18 B-F	36a
4 F	Calc. from (4D x 100/4B)	10 F	Calc. from (10D x 100/10B)	19 B	3, 12
5 B-E	9	11 B	1, 12, 29, 30	19 D	1
5 F	Calc. from (5D x 100/5B)	11 D & Fn 6	1, 31, 32	19 F	Calc from (19D x 100/19B)
6 B	Av. of 3, 8, 10, 11, 12	11 F	Calc from (11D x 100/11B)	20 E	38a
6 C	Calc. from 11	12 B	3, 12	21 B D	1
6 D	Av. of 10, 11	12 D	Av. of 31, 33	21 F	Calc from (21D x 100/21B)
6 E	Calc. from 11	12 E	Calc. from 33	22 B-F	8
6 F	Calc. from (6D x 100/6B)	12 F	Calc. from (12D x 100/12B)		
7 B D	10				

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Contributors: (a) Altland, P.D. (b) Bethell, F.H. (c) Cronkite, E.P. (d) Osgood, E.E.

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44. BLOOD ERYTHROCYTE VALUES: FISH

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
Fn 1	d	9 A-F	7d	15 F	d
1 AB D	4d	10 A-F	3b	16 AB DE	2ad
1 C	5a	11 A-F	3ab	16 C	6d
2,3 A-D F	1ac	12 AB DE	2ad	16 F	d
4-6 ABCDEF	3b	12 F	d	17-22 ABCDEF	3b
7 A-F	7d	13,14 A-C	5a	23 AB DE	2d
8 A-F	3b	15 AB DE	2ad	24,25 A-D F	1ac

Contributors (a) Hart, J.S. (b) Kisch, B. (c) McCutcheon, F.H. (d) Root, R.W.

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45. ERYTHROCYTE DIAMETERS: MAMMALS

Data Coordinates and Footnotes	Contributors and References
1 AB	2b
2-116 AB & Fn 1,2	1c, a

Contributors. (a) Handley, C. O., Jr.: contributed common and accepted scientific names. (b) Osgood, E. E. (c) Ponder, E.

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46. BLOOD ERYTHROCYTE VALUES IN FETUS, NEWBORN, AND IN ADULT FEMALE: MAMMALS

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-5BC, 14-17BC, 26-29BC, 38-41BC, 50-53BC	11ad	2-9FG, 12FG, 14-21FG, 24FG, 26-33FG, 36FG, 38-45FG, 48FG, 50-57FG, 60FG	9ad	7-9NO, 19N, 20NO,	5ad
10BC, 34BC, 46BC, 58BC	3ad	14H, 16HI, 17-19H, 20HI, 21H, 22HI, 24H, 26H, 29-31H, 28HI, 32HI, 34HI, 36H, Fn 6, 10	2ad	10-12NO, 22, 23NO, 24N	13ad
12BC, 24BC, 48BC, 60BC	7bc	1-8JK, 10, 11JK, 12J, 13-20JK, 22, 23JK, 24J, 26-33JK, 36JK, 38-44JK, 46, 47JK, 48J, 49-56JK, 58, 59JK, 60J, Fn 7, 8	12ad, 13ad	29-32NO	6ad
22BC	10ad			34, 35NO, 36N, 43N, 44NO, 46, 47NO, 48N, 55N, 56NO, 58, 59NO, 60N, Fn 11, 12	13ad
36BC	4			3PQ, 5P, 7P, 8PQ, 15PQ, 17P, 19P, 20PQ, 39P, 41P, 43P, 44PQ, 51PQ, 53P, 55P, 56PQ	d
Fn 3	14ad			12P, 24P, 48P, 60P	8ad
Fn 2, 5	ad			25-33PQ	1ad
5-7DE, 10DE, 12D, 17-19DE, 22DE, 24D, 29-31DE, 34DE, 36D, 41-43DE, 46DE, 48D, 53-55DE, 58DE, 60D, Fn 4	12ad, 13ad				

Contributors: (a) Barron, D. H. (b) Bethell, F. H. (c) Osgood, E. E. (d) Young, I. M.

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Berlin, [illegible]
G. B., A[illegible]
(12) Wint[illegible]
Am. J. A[illegible]
Ill., 1950.

47. ERYTHROCYTE OXYGEN CONSUMPTION

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A CDE	8ab	8 A CDE	5ab	17 AB DE	4ab
2 A-E	2ab	9-12 ABCDE	7a	18 A CDE	8ab
3 A CDE	1ab	13 A-E	3ab	19 AB DE	6ab
4 A CDE	5ab	14 A-E	8ab	20 A CDE	5ab
5,6 A-E	7ab	15 AB DE	6ab	21,22 A-E	7a
7 AB DE	6ab	16 A-E	7ab	23 A-E	5ab
				24,25,26 A-E	7a

Contributors (a) Hunter, F. R. (b) Ponder, E.

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48. ERYTHROCYTE CARBOHYDRATE METABOLISM

Data contributed by Spicer, S. S., from Spicer, S. S., and Clark, A. M., J. Biol. Chem. 179:987, 1949, and Spicer, S. S., J. Pharm. Exp. Therap. 99:185, 1950.

49. BLOOD LEUKOCYTE VALUES, BIRTH TO MATURITY: MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
Fn 3	7,8,9	#2-46 F	(##1-45 B and ##1-45 F)	##1-45 N	44
Fn 6	7	##1-45 H	39 and (##1-45 D)	#2-46 N	(##1-45 B and ##1-45N)
1-46 B	Sum of (1-46 D J L N P) checked against 1	#2-46 H	(##1-45 B and ##1-45 H)	##1-45 O	46
##1-45 C	28	##1-45 J	40	#2-46 O	(##1-45 B and ##1-45 O)
Fn 8	34	#2-46 J	(##1-45 B and ##1-45 J)	27-38 G	25 through 27
##1-45 D	37	##1-45 K	41	44, 46 G	5
#2-46 D	(##1-45 B and ##1-45D)	##1-45 L	42	##27-45 I	(##27-45 E and ##27-45 G)
##1-45 E	38	#2-46 L	(##1-45 B and ##1-45 L)	#28-42 I	25 through 27
2,4,6 E	7,8	##1-45 M	43	44, 46 I	25 through 27,5
8 E	8				
##1-45 F	39 and (##1-45 D)				

Note # Even numbers only
Odd numbers only

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Note: * quoted by reference 28
** quoted by reference 24
*** quoted by reference 29
@ quoted by reference 7
@@ quoted by reference 30
@@@ quoted by reference 35

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50. BLOOD LEUKOCYTE VALUES AT ALTITUDE MAN

Data contributed by Diggs, L.W., from Hurtado, A., Merino, C., and Delgado, E., Arch Int. Med. 75 284, 1945

51. BLOOD LEUKOCYTE VALUES IN PREGNANCY AND POSTPARTUM MAN

Data contributed by Bethell, F.H., from Sturgis, C.C., and Bethell, F.H., Physiol Rev. 23 279, 1943.

52 BLOOD LEUKOCYTE COUNTS, ABSOLUTE AND DIFFERENTIAL: MAMMALS, LABORATORY

Data Coordinates	Contributors and References
Cat	
1B	Smoothed av of means fr 1 through 14
2B	Calc. & smoothed fr. (2D x 1B)
3B	Calc. & smoothed fr. (3D x 1B)
4B	Calc. & smoothed fr. (4D x 1B)
5B	Calc. & smoothed fr. (5D x 1B)
6B	Calc. & smoothed fr. (6D x 1B)
1C	Smoothed av. of ranges fr. 1,2,3,4,5,8,10,12,15,16,17, 18,19,20,21
2C	Calc. & smoothed fr. (2E), (1C), (1B)
3C	Calc. & smoothed fr. (3E), (1C), (1B)
4C	Calc. & smoothed fr (4E), (1C), (1B)
5C	Calc. & smoothed fr. (5E), (1C), (1B)
6C	Calc & smoothed fr. (6E), (1C), (1B)
2D	Smoothed av. of means fr. 1,2,4,5,6,8 11,12,17,19,22, 23,24
3D	Smoothed av. of means fr 1,2,4,5,6,8,11,12,17,19,22
4D	Smoothed av of means fr. 4,17,25
5D	Smoothed av. of means fr 1,2,4,5,6,8,11,17,19,21,22, 23,24
6D	Smoothed av. of means fr 1,2,4,8,12,17,19,22
2E	Smoothed av. of ranges fr. 5,8,16,18
3E	Smoothed av. of ranges fr 8,16,18
4E 5E	Calc fr. range fr 25
6E	Smoothed av. of ranges fr 5,8,16,18
	Smoothed av. of ranges fr 8,18,220
Dog	
7B	Smoothed av. of means fr. 5,6,7,8,10,11,13, 26 through 91,92b
8B	Calc. & smoothed fr. (8D x 7B)
9B	Calc. & smoothed fr. (9D x 7B)
10B	Calc. & smoothed fr. (10D x 7B)
11B	Calc. & smoothed fr. (11D x 7B)
12B	Calc. & smoothed fr. (12D x 7B)
7C	Smoothed av. of ranges fr. 4,5,8,10,11,26,27,30,32,33, 34,35,36,39,40,41,42,43,44, 46,47,48,49,50,51,52,53,54, 56,58,59,60,61,64,65,66,72, 73,74,75,76,78,83,84,92b, 93
8C	Calc. & smoothed fr. (8E), (7C), (7B)
9C	Calc & smoothed fr (9E), (7C), (7B)
10C	Calc. & smoothed fr. (10E) (7C), (7B)
11C	Calc. & smoothed fr (11E) (7C), (7B)
12C	Calc. & smoothed fr (12E) (7C), (7B)
8D	Smoothed av of means fr 3,4,5,6,8,11,13,29,30,33, 34,35,36,38,39,43,44,49,50, 51,53,54,55,60,61,62,63,71, 72,73,75,76,78,85,89,90, 92b,93,94
9D	Smoothed av of means fr 3,4,5,6,8,11,29,30,33,34, 35,36,39,44,48,49,53,54,55, 60,61,62 63,71,72,73,76,89, 90,92b,94
10D	Smoothed av of means fr 4,8,34,35,39,44,50,53,66, 92b
11D	Smoothed av of means fr 3,4,8,29,33,34 35,36,39,44, 49,50,53,54,55,60,61,62,63, 71,72,73,76,89,90,92b,94
12D	Smoothed av. of means fr. 3,4,8,33,34,35,36,39,44,50, 53,54,55,60,62,63,71,72, 73,76,89,90,92b,94
8E	Smoothed av. of ranges fr. 3,4,5,30,33,35,39,43,44,60, 61,66,72,76,78,92b
9E	Smoothed av of ranges fr. 3,4,5,30,33,35,38,39,44,60, 61,66,72,76,78,92b
10E	Smoothed av. of ranges fr 4,44,78,92b
11E	Smoothed av. of ranges fr. 3,4,33,35,39,44,60,61,72, 76,78,92b
12E	Smoothed av. of ranges fr 3,4,33,35,39,44,60,61,72, 75,78,85,92b 95
Rabbit	
13B	Smoothed av. of means fr. 3,4,5,7,8,10,11,23,30,33, 37,47,49,51,53,56,67,68,69, 72,73,74,93,94,96 through 150,152 through 159,224, 225,226
14B	Calc & smoothed fr (14D x 13B)
15B	Calc & smoothed fr (15D x 13 B)
16B	Calc & smoothed fr (16D x 13B)
17B	Calc & smoothed fr. (17D x 13B)
18B	Calc & smoothed fr (18D x 13B)
13C	Smoothed av. of ranges fr. 3,4,5,8,11,30,33,37,47,51, 53,67,69,74,77,78,93,96, 102,103,104,105,106,108, 109,110,111,113,114,115, 116,118,119,120,121,122, 123,126,127,129,130,131, 132,135,136,137,139,140, 141,142,143,144,145,146, 147,149,151,156,157,224, 225,226

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Data Coordinates	Contributors and References
14C	Calc. & smoothed fr. (14E), (13C), (13B)
15C	Calc. & smoothed fr. (15E), (13C), (13B)
16C	Calc. & smoothed fr. (16E), (13C), (13B)
17C	Calc. & smoothed fr. (17E), (13C), (13B)
18C	Calc. & smoothed fr. (18E), (13C), (13B)
14D	Smoothed av. of means fr. 4,5,8,11,23,33,44,51,53,55, 56,93,94,96,97,100,104, 105,106,107,108,119,123, 125,130,131,134,135,136, 141,142,148,151,155,156, 160,224,227
15D	Smoothed av. of means fr. 4,5,8,11,33,56,94,100,104, 112,113,116,119,123,130, 131,134,135,141,148,151, 155,156,160,224,225,227
16D	Smoothed av. of means fr. 4,5,8,33,94,96,100,105,108, 112,113,116,119,123,148, 151,155,156,225,227
17D	Smoothed av. of means fr. 3,4,5,8,23,24,33,53,55,56, 78,94,96,100,104,107,108, 112,113,119,125,130,131, 134,135,141,142,148,151, 155,156,158,159,160,224, 225,227
18D	Smoothed av. of means fr. 3,8,33,53,55,94,96,100,107, 112,113,119,130,131,134, 135,141,148,151,155,156, 160,224,225,227
14E	Smoothed av. of ranges fr. 8,11,24,51,67,78,130,135, 137,145,146,161,162,163, 224
15E	Smoothed av. of ranges fr. 3,4,5,8,11,33,78,102,108, 113,115,119,130,135,137, 162,163,224
16E	Smoothed av. of ranges fr. 3,4,5,8,11,24,33,102,106, 108,113,115,119,130,135, 145,146,162,163
17E	Smoothed av. of ranges fr 3,4,5,8,24,33,78,102,106, 108,113,115,119,130,137, 145,162,224
18E	Smoothed av. of ranges fr 8,24,78,101,102,106,107, 113,115,119,130,135,137, 145,146,162,224
Rat	
1F	Smoothed av. of means fr 159,170,171,172,173,174, 175a,176,177,178,179,180, 181
2F	Calc. & smoothed fr (2H x 1F)
3F	Calc. & smoothed fr. (3H x 1F)
4F	Calc. & smoothed fr. (4H x 1F)
5F	Calc. & smoothed fr. (5H x 1F)
6F	Calc. & smoothed fr. (6H x 1F)
1G	95% range calc. fr. 175a
2-6G	Smoothed av. based on ranges fr. 53,175a,181, 183,184,185
2H	Smoothed weighted av. of means fr. 159,170,174,175a, 177,178,179,180,182
3H	Smoothed weighted av. of means fr. 174,175,180,182
4H	Smoothed weighted av of means fr. 170,174,180,182
5H	Smoothed weighted av. of means fr. 159,170,174,175, 178,180,182
6H	Smoothed weighted av. of means fr. 174,181,182
1-3I	95% range calc. fr. 183
4I	184
5-6I	95% range calc. fr. 183
Mouse	
7F	Smoothed av. of means fr. 4,5,8,55,69,164,165,166
8F	Calc. & smoothed fr. (8H x 7F)
9F	Calc. & smoothed fr. (9H x 7F)
10F	Calc & smoothed fr. (10H x 7F)
11F	Calc. & smoothed fr. (11H x 7F)
12F	Calc. & smoothed fr (12H x 7F)
7G	Smoothed av. of ranges fr. 4,8,164
8G	Calc. & smoothed fr. (8I), (7G), (7F)
9G	Calc. & smoothed fr. (9I), (7G), (7F)
10G	Calc. & smoothed fr. (10I), (7G), (7F)
11G	Calc. & smoothed fr. (11I), (7G), (7F)
12G	Calc. & smoothed fr (12I), (7G), (7F)
8H	Smoothed av. of means fr. 4,5,8,55,165,167,168,169
9H	Smoothed av. of means fr. 4,5,8,55,167,169
10H	Smoothed av of means fr. 4,5,167,169
11H	Smoothed av of means fr. 4,5,8,24,55,165,167,168, 169
12H	Smoothed av. of means fr 4,8,55,166,169
8-12I	Smoothed av. of ranges fr 169,228
Guinea Pig	
13F	Smoothed av. of means fr. 4,5,7,8,55,68,74,93,99,123, 133,166,186,187,188,189, 190,191,192,193,194,195, 196,197,198,199,200,201, 202,203,204,205,206,207, 208,209,210,211,212
14F	Calc. & smoothed fr. (14H x 13F)
15F	Calc. & smoothed fr. (15H x 13F)
16F	Calc. & smoothed fr. (16H x 13F)
17F	Calc. & smoothed fr. (17H x 13F)
18F	Calc. & smoothed fr. (18H x 13F)
13G	Smoothed av. of ranges fr. 3,4,8,74,123,187,188,189, 190,194,200,201,202,203, 204,207,208,209,210
14G	Calc. & smoothed fr. (14I), (13G), (13F)
15G	Calc. & smoothed fr. (15I), (13G), (13F)
16G	Calc. & smoothed fr. (16I), (13G), (13F)
17G	Calc. & smoothed fr. (17I), (13G), (13F)
18G	Calc. & smoothed fr. (18I), (13G), (13F)
14H	Smoothed av. of means fr. 3,5,8,23,24,55,123,163,190, 191,192,194,198,199,202, 204,205,206,208,210,211, 212,213,214
15G	Smoothed av. of means fr. 3,5,8,23,55,58,186,190,191, 192,197,198,199,201,202, 204,205,210,212,214,215, 216
16H	Smoothed av. of means fr. 3,5,8,23,55,58,123,163,186, 187,190,191,192,198,199, 202,204,205,210,212
17H	Smoothed av. of means fr. 3,5,8,23,24,55,56,123,163, 186,190,191,192,194,198, 199,202,204,205,208,210, 211,212,214,229
18H	Smoothed av. of means fr. 3,8,55,56,186,190,192,198, 199,202,204,205,208,210, 212
14I	Smoothed av. of ranges fr. 3,4,5,8,56,78,187,188,190, 193,197,198,212,217,218, 219,230
15I	Smoothed av. of ranges fr. 3,4,5,8,123,163,187,190, 193,198,201,202,212,215, 217,230
16I	Smoothed av. of ranges fr. 4,8,190,193,198,202,212, 217,230
17I	Smoothed av. of ranges fr. 3,4,5,8,78,187,188,190,193, 197,198,212,217,230
18I	Smoothed av. of ranges fr. 3,4,8,78,187,188,190,193, 198,212,217,230

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Contributors. (a) Endicott, K. M., (b) Rekers, P. E.

Note: * = quoted by (220)
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Arc[illegible]
Bur[illegible]
Mec[illegible]
Car[illegible]
Dri[illegible]
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d'ar[illegible]
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80, [illegible]
Pat[illegible]
190[illegible]
A., [illegible]
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53 BLOOD LEUKOCYTE RANGES. FARM ANIMALS

Contributor (a) Craige, A.H., Jr.

54 MORPHOLOGY OF BLOOD LEUKOCYTES AND PLATELETS

Data contributed by Rebuck, J W.

55. PROPERTIES AND FUNCTIONS OF WHITE BLOOD CELLS AND RELATED FORMS

Data contributed by Rebuck, J. W. Bibliographic references on file in the office of the Handbook of Biological Data, National Research Council, Washington, D. C.

56 GENEALOGY OF THE FORMED ELEMENTS OF BLOOD
Monophyletic Theory, William Bloom, (1952)

Contributor (a) Bloom, W.

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57 GENEALOGY OF THE FORMED ELEMENTS OF BLOOD
Modified Neo-Unitarian (Monophyletic) Theory (of Downey), Oliver P. Jones, (1952)

Footnotes	Contributors and References
Fn 4	1a
Fn 5	2a
Fn 6	3a
Fn 7	4a

Contributor (a) Jones, O P

References (1) Downey, H., Monocytic Leucemia and Leucemic Reticulo-Endotheliosis, in "Handbook of Hematology," [illegible]
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58. GENEALOGY OF THE FORMED ELEMENTS OF BLOOD

Polyphyletic (Dualist) Theory, Charles A. Doan, (1952)

Contributor: (a) Doan, C. A.

References: (1) Doan, C. A., Cunningham, R. S., and Sabin, F. R., Experimental Studies on the Origin and Maturation of Avian and Mammalian Red Blood Cells, Contributions to Embryol., No 83, Publication 361, Carnegie Institution of Washington, Jan 1925, pp. 163-226.
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59 NOMENCLATURE RECOMMENDED FOR CELLS OF BLOOD AND BLOOD-FORMING ORGANS

Contributors (a) Bethell, F. H., (b) Osgood, E. E., (c) Endicott, K. M., Blood 4 89, 1949.

60. BONE MARROW (STERNAL) DIFFERENTIAL CELL COUNT, MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-31 B	1a	1-31 FG	5a	1-31 KL	8a
1-31 C	2a	1-31 H	6	1-30 MN	*
1-31 D	3a	1-31 IJ	7a	31 MN	**
1-31 E	4				

Contributors (a) Diggs, L. W. (b) Osgood, E. E.

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63. BONE MARROW (RIB) DIFFERENTIAL CELL COUNT: DOG

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-30 BCD	1	1-30 GHI	3	1-30 MNO	5
1-30 EF	2	1-30 JKL	4a		

Contributor· (a) Rekers, P. E.

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65. MORPHOLOGY OF FORMED ELEMENTS OF BONE MARROW. MAN

Data contributed by Rebuck, J. W.

66. HISTOCHEMICAL PROPERTIES OF BLOOD AND BONE MARROW CELLS. MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-21 B & Fn 1	13ab	1 E	11ab, 12ab	20 F	5g
22 B & Fn 16	8f, 9f	3 E	11ab, 12ab	21-22 F	12ab
1-3 C	13ab	4 E	2ab 11ab, 12ab, 15ab	1 G	17ab, 3g, 14h
5-22 C	13ab	5 E	11ab, 12ab, 16	2 G	17a, 14h
13 C	16	6 E	2ab, 11ab, 12ab, 15ab	3-4 G	17a, 3g
Fn 7	6c	7 E	11ab, 12ab	5 G	17a, 14h
Fn 8	13ab	9 E	11ab, 12ab	6-7 G	17a
1 D	11ab, 12ab, 8f	10 E	2ab, 11ab, 12ab	8 G	17a
2 D	12ab	11 E	12ab	9 G	17h
3 D	11ab	11 E & Fn 8	11	9 G	17a
4 D	12ab	13 E	11	11 G	17a
5 D	11ab, 12ab	13 E	11	11 G & Fn 13	3g, 14h
6 D	12ab, 2	13 E & Fn 8	12	12 G	3g, 14h
7 D	12ab	15-19 E	11ab, 12ab	13 G	17a
8 D	12ab	20 E	11	14 G	17a, 3g, 14h
11-13 D	11ab, 12ab	20 E & Fn 8	12	15-19 G	17a, 3g, 14h
15-16 D	12ab	22 E	8f, 15	20 G	3g
18-20 D	11ab, 12ab	1-7 F	12ab	21 G & Fn 15	6c
21 D	12ab	8-12 F	12ab	22 G	17a
22 D	8f, 10f, 16f	13 F	12ab, 16	22 G & Fn 17	7c
Fn 14	4d	14 -19 F	12ab	1-21 H	1e
				22 H	8f

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Contributors: (a) Wislocki, G. B. (b) Bloom, M. L. (c) Lillie, R. D. (d) Gomori, G. (e) Firminger, H. E. (f) Montagna, W. (g) Stowell, R. E. (h) Bacchus, H.

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67. BLOOD WATER AND SOLIDS

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 B-E	a	9,10 BC	3	18-28 B D	3
2 B-E	1	11-13 B D	3	29 B-E	a
3 B-E	2	14 B-E	a	30 B-E	b
4 BC	1	15 BC	a	31 B D	4c
5-7 B D	3	16 BC	b	32-34 B D	3
8 BC	Calc. fr. (9,10 BC)	17 B D	3		

Contributors: (a) Manery, J.F. (b) Allison, J.B. (c) Bacchus, H.

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68 BLOOD CARBOHYDRATES AND RELATED SUBSTANCES

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1,2 B-D & Fn 1,2	60a	30,31 B-D & Fn 3,8	2a	59 BD & Fn 3,4,10,14	14a
3,4 BCD & Fn 3,4	58a	32-35 BC & Fn 3,4	59a	60 BD & Fn 3,4, 10,14	16a
5 BD & Fn 5,6	45a	36 BCD & Fn 5,11	8a	61,62 BC & Fn 3, 4,10,14	16a
6 BD & Fn 7	27a	37,38 BCD & Fn 3,4	59a	63 BD & Fn 3,4, 10,14	15a
7,8 BC & Fn 3,4	59a	39,40 BCD & Fn 5,10	11a	64 BC & Fn 3,4 10,14	16a
9,10 BC	32a	41 BCD & Fn 5,10	49a	65,66 BCD & Fn 3,4,10,14	16a
11 B-D & Fn 3,8	7a	42,43 BCD & Fn 3,4	59a	67 BC & Fn 4,5	54a
12,13 BC & Fn 3, 4,7	59a	44 BC & Fn 12	4a	68 BD	27a
14,15 B-D & Fn 9	3a	45 BCD & Fn 5,10	50a	69 BD & Fn 16	4a
16 B-D & Fn 5,6	7a	46 BCD & Fn 5,11	41a	70-74 BC & Fn 5,17	33a
17,18 B-D & Fn 3,4	59a	47 BD & Fn 5,10	43a	75-77 BD & Fn 3,13,18	23a
19 B-D	57a	48 BCD & Fn 5,11	61a	78,79 BCD & Fn 10,19	62a
20,21 BCD & Fn 5,10	25a	49 BCD & Fn 3 13	12a	80,81 BC & Fn 10,19	62a
22,23 BC & Fn 3,4	59a	50-52 BCD	46a		
24 BCD & Fn 8	6a	53 BCD	36a		
25 BCD	57a	54,55 BD	19a		
26,27 BC & Fn 3,4	59a	56 BC & Fn 12	33a		
28,29 B-D & Fn 3,8	22a	57,58 BC & Fn 3,4,10,14	14a		

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Data Coordinates and Footnotes	Contributors and References
82 BCD & Fn 10,19	63a
83 BC & Fn 10,19	63a
84-87 BCD & Fn 20	55a
88 BCD & Fn 21, 22	64a
89 BCD & Fn 22	53a
90-93 BCD & Fn 22	55a
94 BCD & Fn 22	56a
95 BCD & Fn 23, 24,25	21a
96,97 BCD & Fn 23,24	20a
98 BC & Fn 23,24	21a
99 BCD & Fn 23, 24	20a
100 BCD & Fn 26, 27	48a
101,102 BC & Fn 26	13a
103 BCD & Fn 26	13a
104 BC & Fn 26	13a
105,106 BCD & Fn 26	13a
107 BCD	Calc. fr (108, 109 BCD)
108 BCD & Fn 28	38a
109 BCD & Fn 28	37a
110 BCD & Fn 26	38a
111,112 BC & Fn 28	38a
113 BCD & Fn 29	37a
114 BC & Fn 29	38a
115 BC & Fn 29	40a
116 BCD & Fn 29	38a
117,118 BC & Fn 29	38a
119 BCD & Fn 31	28a
120,121 BCD & Fn 31	9a
122 BC & Fn 22	47a
123 BC & Fn 30	28a
124 BC & Fn 33	47a
125 BC & Fn 30	28a
126,127 BC & Fn 33	47a
128 BCD & Fn 30	28a
129,130 BC & Fn 33	47a
131 BC & Fn 30	28a
132 BC & Fn 33	47a
133 BCD & Fn 30	28a
134 BC & Fn 33	47a
135 BC & Fn 30	28a
136 BC & Fn 33	47a
137 BC & Fn 30	28a
138,139 BC & Fn 33	47a
140 BC & Fn 34	1a
141 BC & Fn 30	28a
142 BC & Fn 33	47a
143 BC & Fn 30	28a
144,145 BC & Fn 33	47a
146-148 BC & Fn 34	1a
149,150 BC & Fn 33	47a
151-154 BC & Fn 34	1a
155,156 BCD & Fn 35	34a
157 BC & Fn 36	29a
158 BCD & Fn 36	29a
159-169 BC & Fn 37	47a
170-174 BC & Fn 38	47a
175-177 BC & Fn 39	26a
178 BCD & Fn 40	24a
179,180 BCD & Fn 39	5a
181 BCD & Fn 39	44a
182 BC & Fn 39	18a
183 BCD & Fn 39	52a
184 BC & Fn 41	10a
185 BCD & Fn 42	51a
186-188 BC & Fn 42	51a
189 BCD & Fn 43	17a
190 BCD & Fn 43	6a
191 BCD & Fn 43	66a
192-194 BC & Fn 43	35a
195 BC & Fn 41	10a
196 BC & Fn 44	30a
197,198 BCD & Fn 45	42a
199 B D & Fn 45	42a
200,201 BCD & Fn 46	65a
202 BCD & Fn 47	24a
203 BC & Fn 48	39a
204 BC	31a

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69: 507, 1948. /56/ Shetlar [illegible]
/58/ Somogyi, M., J. Biol. [illegible]

69. BLOOD LIPIDS

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 B-D & Fn 3	Calc. fr.(2,3 B-D)	45 B-D	4		
2 B-D & Fn 1,2	1a	46 B-D	Calc. fr.(47,48B-D	77 B-D	Calc.fr.(77,78B-D)
3-7 BCD	2a	47 B-D	6	78 B-D	4
8 B-D	b	48 B-D	Calc.fr.(25B-D) and Fn 5	79, 80 B-D	2a
8-11 BCD	2a			81 B-D	3, 3a
12, 13 B-D	1a	49 B-D	b	82 B-D	3
14-18 BCD	2a	50 B-D	10	83-85 BCD	b
19 B-D	Calc.fr.(20,21B-D)	51 B-D	b	86 B-D	b
20 B-D	4	52 B-D	Calc.fr.(52,53B-D)	87 B-D	2a, 2
21, 22 B-D	2a	53 B-D	4	88 B-D	b
23 B-D	Calc.fr.(24,25B-D)	54 B-D	b	89 B-D	b
24 B-D & Fn 4	5a	55 B-D	Calc.fr.(56,57BC)	90 B-D	Calc.fr.(91,92B-D)
26-28 BCD	2a	56 B-D	6	91 B-D	4
29 BC	b	57 BC	Calc.fr.(26B-D) and Fn 5	92, 93 B-D	2, 2a
30, 31 B-D	2a			94 B D	3, 3a
32 B-D	Calc.fr.(33,34B-D)	58-60 BC	b	95 B-D	a
33 B-D	4	61 B-D	Calc.fr.(62,63B-D)	96-99 BCD	2, 2a
34, 35 B-D	2a	62 B-D	4	100 B-D	b
36 B-D	9	63 B-D	6	101 B-D	2, 2a
37 B-D	Calc.fr.(38,39B-D)	64 BD	3a,3	102 BC	b
38 B-D	6	65 B-D	5	103 B-D	Calc.fr.(104,105 B-D)
39 B-D & Fn 5	Calc.fr.(25 B-D)	66-70 BCD	2a		
40 B-D	11	71, 72 B-D	b	104 BC	4
41 B-D	b	73 BC	2a	105, 106 B-D	2, 2a
42 B-D	2a	74 B-D	b	107-118BCD & Fn 7	Calc.fr.(94,106B-D)
43,44 B-D	b	75, 76 B-D & Fn 5	7, 7a	119-125 BCD	2a
				126-128 BCD	a

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70. BLOOD PROTEINS. MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 B	Sum of (2B , 3B), (4B)	2 FG	g	5 FG	Av. of means fr. 1bd, 2g, 3bdg, 4bd, 5bd, 6g
		3 B	Calc fr. (3D)		
1 D	Sum of (2D , 3D)	3 D	7		
1 F	Sum of (5F , 6F)	4 B	Calc. fr. (4F)	6 B	Calc. fr. (6F)
2 B	Calc. fr. 9a, c, 10h, 8e	4 F	Sum of (5F , 6F)	6 FG	12f
		5 B	Calc. fr. (5F)	Fn 1	8e, 11e, 9a, c, 10h, 8e
2 DE	Calc. fr. 9a, 8e				

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71. PLASMA PROTEINS MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-13 B	Calc. fr. (1-13C)	1-9 L & Fn 3	2b	3I	10d
1 C	Sum of (2C , 3C)	2 CD FG	Av. of means fr. 3ae,4g,5aeg, 6ae,8ae,9g	4-9 IJ	Calc. fr. 10d
1-11 E	Calc. fr. (1-11F)	2 IL	2b	14 C	Calc. fr. (4C 5C)
1 F	Sum of (2F , 3F)	3-13 CD	1c	14 F	Calc. fr. (4F 5F)
1-9 H	Calc. fr. (1-9I)	3-11 FG	7f	14 IJ	10d
1 I	Sum of (2I , 3I)			14 L	Calc. fr. (4L 5L)
1-9 K	Calc. fr. (1-9L)			Fn 1	11
				Fn 2	12,7

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References: (1) Gutman, A. B., Moore, D. H., Gutman, E. B., McClellan, V., and Kabat, E. A., J. Clin. Invest. 20 765, 1941. (2) Armstrong, S. H., Jr., Budka, M. J. E. and Morrison, K. C., J. Am. Chem. Soc. 69 416, 1947. (3) Gilligan, D. R. and Ernstene, A. C., Am. J. Med. Sci. 187: 552, 1934. (4) Foster, D. P. and Whipple, G. H., Am. J. Physiol. 58: 365, 1922. (5) Gram, H. C., Acta Med. Scand. 58 107, 1922. (6) Ham, T. H. and Curtis, F., Medicine 17. 413, 1938. (7) Milne, J., J. Biol. Chem, 169. 595, 1947. (8) Starlinger, W. and Winands, E., Zschr. ges. exper. Med. 60 138, 1928. (9) Stefanini, M., Arch. Sci. Med. 69 177, 1940. (10) Taylor, H. L., Mickelesen, O. and Keys A., J. Clin. Invest. 28: 273, 1949. (11) Howe, P. E., J. Biol. Chem. 49 93, 1921. (12) Majoor, C. L. H., J. Biol. Chem. 169. 583, 1947.

72. PLASMA PROTEINS. ANIMALS OTHER THAN MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 F H J	1d	+4 G	6	8 B	(8D) plus (8F)
*1 G I K	1d	*4 H J	2c	8 DE	f
2 F H J	2c	+4 I K	a	**8 F	8
*2 G	3	5 B	(5D) plus (5F)	9 F H J	12d
**3 B	2c, 4b	5 C	2c	*9 G	13d
3 C	4b	**5 D	2c	**10 F	2c, 13d
3 D	2c	***5 H J	2c	++10 H J	2c, 13d
3 F	(3B) minus (3D)	6 B	(6D) plus (6F)	11 B	(11D) plus (11F)
***3 H J	2c	6 D F H J	2c	11 D	14
**4 B	a, 2, 5, 6, 7, 8	7 B	(7D) plus (7F)	*11 E	14
+4 C	9	7 D	2c, 11f	11 F H J	15de
**4 D	2c, 10f	7 E	11f	*11 G I K	15de
+4 E	10f	**7 F	2c	12 B D F H J	2c
4 F	(4B) minus (4D)	***7 H J	2c	13 F H J	2c

Note:
*Calculated from standard deviation from reference(s) indicated.
**Average of means from reference(s) indicated.
***Calculated from A/G ratio from reference(s) indicated.
+Range interval from reference(s) indicated.
++Calculated from average A/G ratio from reference(s) indicated.

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73. PLASMA PROTEINS, CERTAIN PROPERTIES AND REACTIONS. MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-28AB	c	1-10,17-21,25E	c
7-11,17-25C	c, 1, 2	26E	a
2-14,19-26,28D	1	Fn 1	3b, 4b, 5b, 6b, 7b
		Fn 2,3	a

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References: (1) Cohn, E. J., et al., J. Am. Chem. Soc. 72. 465, 1950. (2) Krebs, H. A., Ann. Rev. Biochem 19 409, 1950 (3) Shinowara, G. Y., Jones, L. M , and Reinhard, H. L., J. Biol. Chem. 142 921, 1942. (4) Somogyi, M , J. Biol Chem. 125· 399, 1938. (5) Ambard, L., Bull. Soc. Clin. Biol 3· 51, 1921. (6) Adams, D. H., and Whittaker, V. P., Biochem. J. 44. 67, 1949. (7) Talalay, P., Fishman, W. H., and Huggins, C., J Biol. Chem. 166· 757, 1946

74. PLASMA PROTEINS, PHYSICAL PROPERTIES· MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 B	3	8, 9 C	1	32 D	1
2, 3 B	3; 2 quoted by 4a	11, 12 C	3	3 E	1 quoted by 4a
4, 5 B	3, 2 quoted by 3 & by 4a	13 C	1	4, 5 E	2 quoted by 4a
6 B	3	14 C	1, 3	7 E	2 quoted by 4a
7 B	3; 2 quoted by 3	17 C	1	18 E	2 quoted by 3 & by 4a
8, 9, 11-16 B	3	18 C	1, 3	26, 27 E	2 quoted by 3
10 B	2	20 C	1	3 F	2 quoted by 3
17 B		21 C	1, 3	4, 5, 7-9, 17, 18, 20F	1
18 B	2 quoted by 3	22 C	8 quoted by 1	21 F	6 quoted by 1
19-25 B	3	26, 27 C	1	26 F	7 quoted by 1
26 B	2 quoted by 3	28 C	10 quoted by 1	27, 30, 31 F	1
27 B	2 quoted by 3 & by 4a	29 C	1, 3	32 F	11a
28, 29 B	3	30-32 C	1	4, 5 G	2 quoted by 4a
30-32 B	1	2 D	1	7, 18, 26, 27 G	2 quoted by 3
2 C	3	3 D	5 quoted by 1	3 H	2 quoted by 4a
3 C	3, 2b	4-10 D	1	4 H	2 quoted by 3 & by 4a
4, 5 C	2, 3	11, 12 D	1, 3	7, 18, 26, 27 H	2 quoted by 3
6 C	2b	17, 18 D	1	3, 4, 18, 26, 27 I	2 quoted by 4a
7 C	3	20-22 D	1, 3	3, 4, 7, 18, 26, 27 JK	2 quoted by 4a
		26, 27 D	1	Fn 2	11a
		29 D	1, 3		

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Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 B-H & Fn 4	6a, f	26 B GH	d, 1	51 B GH	d, 1
2 B GH	9e	27 B-H	21c	52 B H	3f
3 B-D	10a	28 B-D GH	12a	53 B GH	9e
4 B-H	11ac	29 B GH	9e	54 B GH	21c
5 B-H	11a, 12a	30 B GH	d, 1	55 B-H	21c
6 B GH	9e	31 B-H	21c	56 B-D GH	12a
7 B GH	1b	32 B-D GH	12a	57 B GH	9e
8 B H	3f	33 B GH	9c	58 B GH	d, 1
9, 10 B H	8a, f	34 B GH	d, 1	59 B-H	1bac
11 BC E G	13a	35 B-GH	12a	60 B GH	17a
12 B-H	21c	36 B GH	12ad	61 B-D GH	12a
13 B GH	12a	37 B GH	9e	62 B G	19g
14 B G	13a	38 B GH	d, 1	63 B GH	18a, 9e
15 B H	14a	39 B-H	21c	64 B GH	18a
16 B H	14a	40 B GH	12a	65 B-D GH	d, 1
17 B H	14a	41 B GH	20g	66 B GH	18a
18 B GH & Fn 7, 8	15a, f	42 B GH	9e	67 B-G	21c
19 B G	2	43 B GH	d, 1	68 B-D GH	12a
20 B G	8a	44 B-H	21c	69 B GH	20g
21 B GH	9e	45 B-D GH	12a	70 B GH	9e
22 B E-H	6a	46 B GH	9e	71 B GH	1d
22 B D	4f, 5f, 6a, 7f	47 B GH	d, 1	72 B-H & Fn 20	d, 1
23 B G	6a	48 B-H	21c	73 B-D GH	12a
24 B GH	9e	49 B-D GH	11a, 12a	74 B GH	9e
25 B G	6a	50 B GH	9e	75 B GH	d, 1

Contributors (a) Beerstecher, E., Jr, and Spangler, S (b) Williams, J. N., Jr. (c) Bergeim, O. (d) Hier, S W. (e) Steele, B. F. (f) Hamilton, P. B (g) Schweigert, B. S.

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76 [illegible]

Data Coordinates and Footnotes	Contributors and Ref[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1 B-D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2 B-D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3 B-D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4-6 BCD & Fn 6, 7, 8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7 BC	1	[illegible] BCD & Fn 12, 13, 14	14b, 15b	32-33 BC	5
8 B-D	10c	25 B-D	2	34 BC	6
9, 10 B-D & Fn 9, 10	14b, 15b	26 B-D	3	35 B-D	7
				36 BC	1

Contributors (a) Beerstecher, E, Jr, and Spangler, S, (b) Looney, J M (c) Williams, J N

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77. NITROGEN CONTENT OF BLOOD NITROGEN COMPOUNDS

References: All values are calculated from molecular weights and formulae as presented in "Handbook of Chemistry and Physics." Hodgman, C. D., Editor, Chemical Rubber Publishing Co., Cleveland, 1948, except those for items 9, 11, 21, 42, 46, 50, and 51 which were calculated from data in "Human Biochemistry," Kleiner, I. S., C. V. Mosby and Co., St. Louis, 1948.

78. BLOOD PHOSPHORUS, INORGANIC

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-3 ABC & Fn 2	6	10 A-C & Fn 4	2a	17 A-C & Fn 4	2
4 AB & Fn 3	3	11 A-C & Fn 4	2	18 A-C & Fn 4	2
5 A-C & Fn 4	2a	12 AB & Fn 3	3	19 A-C & Fn 6	5a
6 A-C	2a	13 AB & Fn 3	3a	20 AB & Fn 3	3
7 A-C	5a	14 AB & Fn 3	3	21 AB & Fn 3	3a
8 AB & Fn 3	3	15 AB	3	22-24 A-C & Fn 3	5a
9 A-C & Fn 4	a	16 A-C & Fn 4	2	25-40 AB & Fn 3	3

Contributor: (a) Freeman, S.

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79. BLOOD PHOSPHORUS, ORGANIC ACID-SOLUBLE

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1,2 ABC & Fn 2	1a	15,16 AB & Fn 3	3	30 AB & Fn 3	3
3,4 AB & Fn 3	3	17-19 AB & Fn 4	2	31,32 AB & Fn 4	2
5 ABC	3a	20 AB & Fn 4	2a	33-36 AB & Fn 3	3
6-8 AB & Fn 3	3a	21-24 AB & Fn 4	2	37-40 AB & Fn 4	2
9,10 AB & Fn 4	2	25,26 AB & Fn 3	3	41-44 AB & Fn 3	3
11,12 AB & Fn 3	3	27,28 AB & Fn 3	2	45,46 AB & Fn 4	2
13,14 AB	3a	29 AB & Fn 3	3a	47,48 AB & Fn 3	3
				49-60 AB & Fn 4	2

Contributor: (a) Freeman, S.

References: (1) Helve, Acta Med. Scand 125:505, 1946. (2) Rapoport, S., & Guest, G. M., J. Biol. Chem. 138 269, 1941. (3) Kerr, S. E., & Daoud, L., J. Biol. Chem. 109:301, 1935.

80. BLOOD ADENOSINE TRIPHOSPHATE PHOSPHORUS

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1,2 A-C & Fn 2	1	25,26 AB	1	39-42 ABC & Fn 2	1
3,4 AB & Fn 2	1	27,28 AB & Fn 2	1	43,44 ABC & Fn 2	1
5-8 AB & Fn 2	1a	29,30 AB & Fn 2	1	45,46 ABC & Fn 3	2
9,10 AB & Fn 3	2	31,32 AB & Fn 3	2	47,48 AB & Fn 2	1
11,12 AB & Fn 3	1	33,34 AB & Fn 2	2	49-52 AB & Fn 3	2
13,14 AB	2	35,36 AB & Fn 2	1	53-56 ABC & Fn 3	2
15,16 AB & Fn 2	1	37,38 AB	2	57-60 AB & Fn 3	2
17-24 AB & Fn 3	2				

Contributor: (a) Freeman, S.

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81. BLOOD DIPHOSPHOGLYCERATE PHOSPHORUS

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1,2 A-C & Fn 3	1a	13,14 AB & Fn 4	1	20 A-C	2
3-5 AB & Fn 4	2	15 AB & Fn 4	2	21-27 AB & Fn 4	2
6 A-C & Fn 4	2	16 A-C & Fn 4	2	28 A-C & Fn 4	2
7-12 AB & Fn 4	2	17-19 AB & Fn 4	2	29-36 AB & Fn 4	a

Contributor: (a) Freeman, S.

References: (1) Helve, Acta Med. Scand. 125 505, 1946. (2) Guest, G.M., & Rapoport, S, J. Biol. Chem. 138 269, 1941.

82. BLOOD NUCLEOTIDE PHOSPHORUS

All data from Kerr, S. E. and Daoud, L., J. Biol. Chem. 109 301, 1935.

83. BLOOD LIPID PHOSPHORUS

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1,2 AB & Fn 1	1b	5 AB & Fn 1	3	7 A C & Fn 1	4a
3 A-C	2	6 A C & Fn 2	6a	8 A-C & Fn 1	5a
4 AB & Fn 1	1b	6 AB & Fn 3	7a		

Contributors (a) Flock, E.V. (b) Stearns, G

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84 BLOOD HEXOSE PHOSPHATE PHOSPHORUS

All data from Helve, Acta Med Scand. 125.505, 1946.

85. BLOOD PHYTIC ACID PHOSPHORUS

All data from Guest, G M and Rapoport, S, J Biol Chem 138 209, 1941

86 BLOOD SULFUR

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-5 BCD	3a	10 BC	1	14 B-D & Fn 1	a, 1a
6,7 BC	2b	11,12 B-D	3a	15-17 BC	2b
8 BC	1	13 BC	2b	18-20 BCD	3a
9 BC	2b				

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87. BLOOD SULFUR COMPOUNDS

Data Coordinates and Footnotes	Contributors and References
1-3 BCD	7a
4,5 BC	Calc.fr. 1
6 B-D	7a
7 BC	7a
8,9 B-D & Fn 1	7a
11,12 B-D & Fn 3	a
13 BC	6c
14 B-D	Calc.fr.(15,16 B-D)
15 B-D	9a

Data Coordinates and Footnotes	Contributors and References
16 BC	6c
17 BC	Calc.fr.(18,19 BC)
18,19 BC	4b,5b
20 BC	10a
21 BC	Calc.fr.(20 BC)
22 BC	6c
23 B-D	2c
24,25 BC	4b,5b
26 BC	10a

Data Coordinates and Footnotes	Contributors and References
27 BC	Calc.fr.(26 BC)
29 B-D	11a
30 B-D	Calc.fr.(29 BC)
31 BC	5b
32 BC	Calc.fr.(33,34 BC)
33 BC	4b,5b
35 BC	10a
36 BC	Calc.fr.(35 BC)
38-42 BCD	3c

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nek,
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B.,

88 BLOOD VITAMINS

Data Coordinates and Footnotes	Contributors and References
1 B-D GH	22a,26a,71a
1-15 E & Fn 2	55a
2 B-D GH	4a,32a,34a,37a,40a
3 B-D GH	2a,5a
4 B-D GH	49a
5 B-D GH	21a
6 B-D GH	20a,81a
7 B-D GH	17a
8 B-D G	45a
8 H	24a
9 B-D G	82a
10 B D GH	26a
11 B-D G	34a
11 H	40a
12 B-D GH	49a
13 BC	21a
14 B-D GH	45a
15 B-D G	82a
15 H	11a,82a
16 B-D	39b
16 E	56a
16 GH & Fn 3	33a,56a
17 B-D GH & Fn 3	3a,34a
18 B-D GH & Fn 3	35a,49a
19 B-D GH & Fn 3	21a
20 B-D GH & Fn 3	35a,84a
21 B-D GH & Fn 3	70a
22 B C G	49a
22 B D H	57a
23-37 B-D & Fn 4,7	9
38 B-D GH & Fn 3	10a
39-40 BC & Fn 3	52a
41 B H & Fn 3	30a
42 B D & Fn 3	77a
42 B G & Fn 3	30a

Data Coordinates and Footnotes	Contributors and References
43 B H & Fn 3	30a
44 B G & Fn 3	30a
45 BC & Fn 3	52a
46 B G & Fn 3	30a
47 B-D F H & Fn 1	30a,58a
48 B GH & Fn 1	30a
49 B H & Fn 1	31a
50 B H & Fn 2	25a
51-52 B G & Fn 1	30a
53 B G & Fn 1	25a
54 B H & Fn 1	25a
55 B G H & Fn 1	30a,31a
56 B G H & Fn 2,3	76a
57 B E G & Fn 3	74a
58 B G & Fn 2,3	75a
59-61 B GH & Fn 1	75a
62 B GH & Fn 1	75a
63 B GH & Fn 1,2	46a,67a,71a
64 B GH & Fn 1	13a,14a,46a
65 B GH & Fn 1	61a
66 B GH & Fn 1	79a
67 B H & Fn 1	55a
68 B GH & Fn 1	79a
69 B GH & Fn 5	65a
70 BC & Fn 5	52a
71 B-D & Fn 6-9	28a,47a,54a
71 B E & Fn 6, 7,10	27a
71 B GH & Fn 6,7	8a,29a,38a
72 B C & Fn 6,7	80a
73 B-E & Fn 6, 7,10	1a,41a,50a
73 D-E & Fn 6	27a
74 B D & Fn 6,12	1a

Data Coordinates and Footnotes	Contributors and References
75 B-D & Fn 6, 7,13	1a,41a,50a
76 B C & Fn 6,7	50a
77 B C & Fn 6,7	1a,41a,50a
78 B-D & Fn 6	63a
79 B-D & Fn 6,7	1a,41a,48a,50a
80 B-D & Fn 4, 6,7	23
81 B-D & Fn 6	44a,62a,66a
81 B EF & Fn 6	42a
81 B GH & Fn 6	42a,59a,83a
82 B-H & Fn 6	83a
83 B-H & Fn 6	a
84 B-H & Fn 6	a
85 B-H & Fn 6	a
86 B-H & Fn 6	42a,48a
87 B-D & Fn 6	16a,43a
88-89 BC & Fn 1	52a
90 BC & Fn 1,2	60a
90 B D G & Fn 1,2	10a
90 B H & Fn 1,2	10a,60a
91 B D H & Fn 1,2	60a
92 B D H & Fn 1,2	60a
93 B-D & Fn 1,2	42a,48a
94 B D H & Fn 1,2	60a
95 B-D G & Fn 1	60a
96 B-D G & Fn 1	60a
97 B-D G & Fn 1	60a
98 B-D G & Fn 1	60a
99 B-D G & Fn 1	60a
100 B-D G & Fn 1	60a

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Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
101 B-H	19a	110 B-D GH & Fn 6	23a	119 B D & Fn 12	78a
102 BC	52a	111 B D & Fn 1	72a	120 B-D & Fn 8-12	78a
103 BC	42a, 48a	112 B-F & Fn 1, 12	64a	121 B D & Fn 8	53a
104 B D & Fn 3	2a, 6a, 68a	113 B-F & Fn 1,12	64a	122 B-D & Fn 12	19a, 78a
104 B E-H & Fn 3	7a	114 B-H & Fn 1,8	64a	123 B-D & Fn 8	36a
105 B-D & Fn 1	68a	115 B-D & Fn 8, 9,10	12a	123 B C & Fn 8	19a, 78a
106 B-D & Fn 1	68a	116 B-D & Fn 8	15a	124 B-D & Fn 12	78a
107 BC & Fn 1	68a	116 B GH & Fn 8	18a	125 B-D H & Fn 8	36a
108 B-D F & Fn 1,4,5	42a, 48a	117 B D & Fn 12	78a	126 B C & Fn 12	78a
109 B-D & Fn 1	42a, 48a	118 B D & Fn 12	78a	127 B E & Fn 13	73a

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Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 BC & Fn 2	a	23 BC & Fn 18	20eb, 12g, 7g	43 BC	b, 16e
2 BC & Fn 2	b	24 BC	b	44 BC & Fn 31	17e
3-4 B D & Fn 4	30dc	25 BC	8, 8e	45 BC	18e
5 B-D	le	26 B D	8, 8e	46 BC	21e
Fn 5	11	27 BC	b	47 B D & Fn 32	23jk
6 B D & Fn 6	f	28 BC	9e	48 B D & Fn 32	19g
7-10 B D & Fn 7	2	29 BC	10e, g	49-50 B D & Fn 32	22j
11 BC & Fn 7,38	3,3c	30 BC	6, 6e	51 B D & Fn 32	26k
12 B D	b	31 B D & Fn 21	32 h	52 B D & Fn 32	24
13 B D	h	32-34 BC	b	53-55 B D & Fn 32	26k
14 BC	4c	Fn 22	11	56 B D & Fn 34	25e
15-16 BC & Fn 9, 10,11,12	5cg	35 BC	12e	57 B D & Fn 35	25
		36 BC & Fn 26-28	13ei	58 BC & Fn 34	27m
17 BC & Fn 14	5	37 B D & Fn 29	i	59 B D	b
18 BC	5g	38-40 BC & Fn 30	13i	Fn 37	28m
19-21 & Fn 13-15	5	41 BC & Fn 27,30	15e	Fn 40	29n
22 BC	6,6e	42 BC & Fn 27	14	Fn 41	33o

Contributors: (a) Sayers, G. (b) Roberts, S. (c) Catchpole, H. (d) Hilmer, P. E. and Hess, W. (e) Zarrow, M. X. (f) Venning, E. (g) Bischoff, F., (h) Von Euler, U. S. (i) Forbes, T. R. (j) Chaikoff, I. L. (k) Hansel, W. (m) Paschkis, K. E. (n) Asdell, S. A. (o) Samuels, L. T.

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90. BLOOD ENZYME ACTIVITY

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A-C, 4 A-C & Fn 1, 3	6e	30-32 ABCD & Fn 11	21n	102,103 A-D & Fn 21	24e
2,3 A-D & Fn 2	17jk	33-40, 43, 44 A-D, & Fn 12	11n	104,105 ABC	dj
5-8 ABCD & Fn 4	22j	42 A-C	20n	106 A-D & Fn 22	26m
9 A-D & Fn 5	23j	45-92 ABC	2in, 12in, 19in	107 A-C	28h
10-17 ABCD & Fn 6	16j	93 A-D & Fn 18	18j	108 A-D & Fn 23	14j
18-26 ABCD & Fn 7	1ja	94 A-C	27h	109 A-D & Fn 24	10jg
27 A-C & Fn 8	13c	95, 96 A-D & Fn 19	8j	110-112 ABCD	3jo
28 A-D & Fn 9	7j	97-100 ABCD & Fn 20	5j	113 A-D & Fn 29	9f
29 A-D & Fn 10	4b	101 A-C	27h	114 A-D & Fn 30	25

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91. BLOOD COENZYMES

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A-E	2	5-17 ABCDE & Fn 2	a	20 A-E	a
2-4 ABCDE & Fn 1	1c	18, 19 A-E	3b	21-23 ABCDE & Fn 3	4b

Contributors (a) Beerstecher, E., and Spangler, S. (b) Granick, S. (c) Lehninger, A

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92. BLOOD ELECTROLYTES

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 BCD	41f, 42f	39 BCD	6	78 BCD	20e
2,3 BCD & Fn 2,3	13h, 14h, 15h	40 BC	29e, 33e	79 BCD	10c, 12c
4 BCD & Fn 2,3	21	41 BCD	33e	80 BCD	31e
5 BCD	Calc fr 6,7 BCD	42 BCD	7d, 8d	81 BCD	Calc. fr 82,83 BCD
6 BCD & Fn 3	9d	43, 44 BCD	37e	82 BCD	10c
7 BCD & Fn 3	11g, 25g, 35g	45, 46 BCD	4b	83 BCD	5e
8 BCD & Fn 3	3d, 7d, 8d, 9d	47 BCD	31d	84 BCD	31d
9-11 BCD & Fn 3	11g, 25g, 35g	48 BCD	24e	85 BCD	20e
12 BC & Fn 4	4b	49 BC	23e	86 BCD	10c, 12c
13 BC	40f	50 BCD	Calc fr 51,52 BCD	87 BCD	20e
14 BCD	33d	51 BC	43c	88 BC	Calc fr 89,90 BC
15 BCD	Calc fr 16,17 BCD	52 BCD	20a	89, 90 BC	10i
16, 17 BCD & Fn 3	g	53 BC	Calc fr 54,55 BCD	91 BC	Calc. fr 92,93 BC
18 BCD	41f, 42f	54, 55 BC	7c, 12c	92, 93 BC	28i
19, 20 BCD & Fn 3	16h, 17h	56 BCD	20e	94 BC	Calc. fr 95,96 BC
21 BCD	6d	57, 58 BCD	10c, 12c	95, 96, 98, 99 BC	28i
22 BCD	Calc fr 23, 24 BCD	59 BC	Calc. fr 60,61 BCD	97 BC	Calc. fr 98,99 BC
23 BCD	9d	60 BC	7c, 12c	100 BC	2c, 22c
24 BCD	11g, 25g, 35g	61 BCD & Fn 7	4b	101 BCD	27i
25 BC	19e	62 BCD	7d, 8d	102, 103 BC	32i
26-28 BCD	11g, 25g, 35g	63 BC	Calc. fr 64,65 BC	104-109 BC	1i
29 BC & Fn 3	4b, 4e	64 BC	10c, 10i	110 BCD	42f, 44f
30 BCD & Fn 3	5	65 BC	10c, 10i	111, 112 BC	15h
31 BCD	31d	66, 67 BC	28i	113, 114 BCD	15h
32 BC	36e	68 BC	38i	115 BCD	Calc. fr 116,117 BCD
33 BCD	Calc. fr 34,35 BCD	69 BC	Calc fr 70,71 BC		
34, 35 BCD	34g	70, 72, 76 BCD	10c, 12c	116 BCD	9d
36 BC	36e	71, 73, 74 BC	10c	117 BCD & Fn 8	30a
37 BC	26e	75 BCD	20e	118-120 BCD	25g
38 BCD	18e	77 BCD	10c, 12c	121 BC & Fn 9	4b

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Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
122 BC	40d	127 BC	4b	132 BC	46e
123 BCD	g	128 BC & Fn 11	5	133 BCD	5
124, 125 BCD & Fn 10	15h	129 BCD	6d	134 B D	39
		130 BCD	29e	135 BC	30g
126 BCD & Fn 10	30a	131 BCD	45e	136-138 BCD	g

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93. BLOOD MINOR MINERALS

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-3 BCD	11e	21, 22 B-D	21b	34 B-D	2a
4 B D	5	23 B-D	3, 4, 14, 15, 16, 25b	35 BC	8a
5-7 BCD	7a	24 B-D	19c	36-38 BCD	11e
8, 9 B D	1b	25, 26 B-D	22b	39, 40 BC	23
10 BC	14b	27 BC	10b	41-43 BCD	11e
11-13 BCD	20b	28, 29 B-D	22b	44 BC	21b
14 B-D	2a	30 B-D	9, 18d	45 B-D	12b
15, 16 B-D	20b	31 B-D	17c	46 BC	26b
17 BC	6b	32 B-D	19	47, 48 BC	12b
18-20 BCD	13e	33 B-D	8a	49, 50 BC	26b
				51-54 BCD	11e
				55-58 BCD	24

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94. BLOOD GASES MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
Fn 1,2	m	13,14 G	(5,6G)	19-22 HI & Fn 20	20m,21m
1,2 A & Fn 5	1n,2n, 13e	13,14 H	(1,2B,13,14B) & 51hk	23-26 ABCDEF	(15-18 ABCDEF & 19-22 ABCDEF)
1,2 B	k, 4k	15 AB	Av. of 5d,25gj,31g, 27j,28j,17jo, 21gj,19a,45g,46g, 26g	23-26 G	(15-18G)
Fn 6	3, 4k	16AB & Fn 17	(15 AB) & 25k	23-26 H	21k
1,2 E	(1B)	15,16 C	(15,16B & 15,16D)	23 I	Av. of 5d,8h,12h, 18h, 21gjm,25gj, 26g,27j,28jm, 39m,40m,42m, 43m,45g,46g, m
Fn 8	k	15,16 D	(15,16F)	24 I	(23I & Fn 8) 25g
3-6 ABCDEF	(7-10 ABCDEF & 11-14 ABCDEF)	15,16 E	(15,16C)	25 I & Fn 21	k
Fn 11	Av. of 5d, 8h, 11h, 12h, 13e, 16ehm, 18h, 27j, 28j	15,16 F & Fn 15	(15,16B & 15, 16H)	26 I	(26F & 26 G & Fn 19) k
3,4 G	Av of 5d, 6ch, 7ch, 8h, 9chj,10ch,11h, 12h, 13ei	15 G	Av. of 5d,25jg,31g, 6h,7h,32g,8h, 34h,27j,11h,12h, 28j,k,10ij,19a, 21g,45g,46g,26g	27-30 AB	(27-30C & 27-30D)
3,4 I	Av. of 47f, 48f, 49f	16G	(16F & 24I & Fn 18) 32m, 25m	27-30 C	(27-30E)
5,6 G	(13, 14H) & 50hk	Fn 18	33m	27-30 D	(27-30F)
Fn 13	Av. of 5d, 13ei, 11h	Fn 19	22m, 23m, 24m	27-30 E	(27-30H & 23-26E)
7-10 ABCD	(7-10 EF)	15,16 H	30m	27-30 F	(27-30I & 23-26F)
7-10 EF	(7-10 GHI)	15,16 I	(3,4I & Fn 16)	27-30 G	(15-18G)
7,8 G	(3,4 G)	17,18 AB	(15,16B & 15,16I)	27-30 HI & Fn 22	Calc. by k based on 21k, 35k, 36k, 37k, 38k,
9,10 G	(5,6G)	17,18 C	(17,18B, 17,18D)	31-34 ABCDEF	(23-26 ABCDEF & 27-30 ABCDEF)
7-10 HI & Fn 14	14c	17,18 D	(17,18F)	35-38 AB	(31-38C & 35-38D)
11,12 A-C	(1,2 B & 11,12H)	17,18 E	(17,18C)	35-38 C	(35-38E)
11,12 D	(11,12B & 11,12C)	17,18 F	(17,18B & 17,18H)	35-38 D	(35-38F)
11,12 E	(11,12C)	17,18 G	(17,18F & 25, 26I & Fn 19)	35-38 E	(35-38G, 35H)
11,12 F	(11,12D)	17,18 H	(15,16H)	35-38 F	(35-38G & 35I)
11,12 G	(3,4G)	19-22 ABCD	(19-22E, F)	35-38 G & Fn 23	Calc. by k based on 7h, 11h, 12h
11,12 H	Av. of 15chj, 16ehn, 17c, 8h	19-22 E	(19-22G, H)	35-38 HI & Fn 24	14m, 44m
13,14 A-C	(13,14B & 13,14H)	19-22 F	(19-22G, I)		
13,14 D	(13,14B & 13,14C)	19-22 G	(15-18G)		
13,14 E	(13,14C)				
13,14 F	(13,14D)				

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95. ARTERIAL BLOOD GASES, O_2 AND CO_2, AT ALTITUDE: MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 B E-G	See Table 94	24 C	2	37 B	1b
1 C	2	25 E	4b	37 C-G	6ab
2,4,6,8,10,12, 14,16 B	1b	26 B E-G	4b	38 C-G	6b
2-17 C	2	26 C	2	39 B	1b
2-17 E	3b	27 E	Av. of 1,3,4	39 C-E G	6ab
2-17 F	1b	27 FG	4b	40 C-E G	6b
18 C	2	28 B E G	4b	41 B	1b
18,19 E	3b	29 E	Av. of 1,3,4	41 C-G	6ab
20 B E-G	4b	29 G	4b	42 C-G	6b
20 C	2	30 B E-G	4b	43 B	1b
21 B E-G	5b	30 C	2	43 C-G	6ab
21 C	2	31 E	Av. of 1,3,4	44 C-G	6b
22 B E-G	4b	32 C	2	45 B-G	7b
22 C	2	32 E	1	46 B-G	9ab
23 E	Av. of 1,3,4	33 E	Av. of 1,3	47 B E-G	7ab
23 FG	4b	34 B-G	1b	47-49 CD	8
24 B E-G	4b	35 B	6a	48 B E-G	7ab
		35 C-G	6ab	49 B E-G	7ab
		36 C-G	6b	Fn 6	6ab

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96. IONIC BALANCE AND BUFFER BASE, ARTERIAL BLOOD, CELLS AND PLASMA: MAN

Diagram contributed by Singer, Richard B.

97. ACID-BASE VALUES, BLOOD AND PLASMA MAN

Data Coordinates and Footnotes	Contributors and References
Fn 1	a, 1a
Fn 2	a, 47a, 48a, 49a
Fn 3	a, 30a, 32a
Fn 4	a, 50a, 51a, 52a, 42a
Fn 5	a, 53a, 54a, 55a
Fn 6	a, 56a, 57a, 1a
Fn 7	a, 58a, 59a, 60a, 61a, 62a, 1a, 63a, 64a
Fn 8	a, 65a
Fn 9	a, 1a
Fn 10	a, 56a, 57a, 66a, 1a, 67a
Fn 11	a, 65a, 1a, 29a, 36a
Fn 12	a, 62a, 39a, 69a, 70a
Fn 13	a, 41a
Fn 14	a, 39a
Fn 15	a, 1a, 38a
Fn 16	a
Fn 17	a
Fn 18	a, 3a, 1a
Fn 19	a
Fn 20	a, 3a, 1a
2 B-O	39a
3 BC	40a
3 DE	20a
3 H-O	14a, 1a
3 P	23a, 24a
6 B-I	40a
6 PQ	23a, 24a, 25a
7 B-E	3a
7 F-O	1a, 3a, 41a
9 FG	1a, 41a
9 HI	41a
9 J-O	1a, 41a
9 PQ	23a, 24a, 25a, 26a
10 BC	1a, 3a, 4a, 5a, 6a, 7a
10 DE	38a, 42a, 43a, 44a, 45a
10 FG	1a, 3a, 4a, 5a, 6a, 7a, 8a
10 HI	1a, 7a, 9a
10 JK	1a, 4a, 5a, 6a
10 LM	1a
10 NO	1a, 3a, 7a, 8a, 9a
11 BC	1a, 11a, 12a, 13a
11 FG	1a, 11a, 12a, 13a
11 HI	1a
11 JK	1a, 11a, 12a, 13a
11 LM	1a
11 NO	1a, 11a, 12a, 13a
12 BC	1a, 5a, 16a, 19a, 20a
12 DE	1a, 15a, 16a, 19a, 20a, 37a
12 FG	1a, 15a, 16a, 19a, 20a
12 HK	1a, 15a, 16a, 17a, 18a, 45a
12 L-O	1a
12 PQ	26a, 27a, 28a
14 BG	1a, 11a
14 HI	1a
14 JK	1a, 11a
14 LM	1a
14 NO	1a, 11a
15 DE	37a
15 FG	1a
15 HI	18a, 21a, 22a, 46a
15 JK	1a, 18a, 22a, 46a
15 LM	1a, 21a
15 NO	1a
15 PQ	28a
16 B-M	10a
16 NO	1a, 10a
17 B-G	1a, 13a
17 HI	1a
17 JK	1a, 13a
17 LM	1a
17 NO	1a, 13a
19 B-G	10a
19 HI	1a
19 JM	10a
19 NO	1a, 10a

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98. EFFECTS OF RADIATION ON PERIPHERAL BLOOD

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1,2,3 A-E	11a	29 A-E	13a	48-51 ABCDE	8a
4 A-E	20a	30 A-E	2a	52-58 ABCDE	10a
5 A-E	9a	31-34 ABCDE	4a	59-63 ABCDE	6a
6,7,8 A-E	17a	35-39 ABCDE	10a	64,65 A-E	5a
9-13 ABCDE	5a	40 A-E	7a, 17a	66,67 A-E	3a
14 A-E	17a	41 A-E	7a, 14a, 15a	68 A-E	18a
15,16 A-E	3a	42 A-E	7a	69 A-E	12a
17 A-E	19a	43,44 A-E	5a	70 A-E	1a
18-28 ABCDE	10A	45-47 ABCDE	3a		

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*For information regarding the availability of starred references, the Reference Services Branch, Technical Information Service, U. S. Atomic Energy Commission, Oak Ridge, Tennessee should be contacted.

99. EFFECTS OF RADIATION ON HEMATOPOIETIC TISSUES

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1-10 ABCDEF	8a	35-37 ABCDEF	9a	102-107 ABCDEF	1a
11-14 ABCDEF	10a	38-42 ABCDEF	3a	108-111 ABCDEF	7a
15-17 ABCDEF	1a	43 A-F	1a	112-114 ABCDEF	1a
18, 19 A-F	9a	44-49 ABCDEF	3a	115 A-F	6a
20, 21, 22 A-F	1a	50-90 ABCDEF	1a, 5a	116-135 ABCDEF	1a, 6a
23-27 ABCDEF	3a	91-97 ABCDEF	1a	136 A-F	2a
28-34 ABCDEF	1a	98-101 ABCDEF	7a		

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100. CHANGES IN STORED PRESERVED BLOOD

Data Coordinates and Footnotes	Contributors and References
1-45 & Fn 1-14	Read from smoothed curves in 1
46	Read from smoothed curve in 2

References (1) Rapoport, S., J. Clin. Invest. 26 591 1947 (2) Strumia, M.M., and McGraw, J.J., "Blood and Plasma Transfusions," F.A. Davis Co., Phila., 1949.

101. EFFECTIVE BLOOD LEVELS OF THERAPEUTIC AGENTS. MAN

Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
1 A-F	1a	16 A-E G	14a	31-33 ABCDE G	a
2 A-F & Fn 1	2a	17 A-F	15a	34 A-F	28a
3 A-F	3a	18 A-F	16a	35 A-F	29a
4 A-F	4a	19 A-F	17a	36 A-F	28a
5-7 ABCDEF	5a	20 A-E G & Fn 4	18a	37-41 ABCDE H & Fn 7	30a
8 A-F	6a	21 A-F	19a	42,43 A-F & Fn 8	31a
9 A-F	7a	22 A-E G	20a	44 A-F	a
10 A-F	8a	22 A-E H	21a	45 A-E G	32a,33a
11 A-F	9a,10a	23,24 A-E H & Fn 5	22a	46 A-F	34a
12 A-F	11a	25 A-E H	23a	47-49 ABCDEF	35a,36a
13 A-F	12a	26 A-F	24a	50 A-F	37a
14 A-E H & Fn 2	13a	27 A-E G & Fn 6	25a	51-53 ABCD G	38a
15 A-F & Fn 3	1a	28 A-E G	26a		
		29 A-E G	27a		
		30 A-E G	27a		

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Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References	Data Coordinates and Footnotes	Contributors and References
54 A-E H & Fn 9	39a	80,81 AB DE H & Fn 14	53a	98 A-D G	62a,63a
55 A-E G	40a	82 A-F	54a	99 A-E G	64a,65a
56 A-E G	41a,42a	83-85 ABCDE G & Fn 15	55a	100 A D F	66a
57,58 A-E G	43a	86 A-F	56a	101 A-D G	62a,63a
59 A-E G	44a	87 A-E G	57a	102 A-D F	66a
60 A-F & Fn 10	45a	88,89 A-F	58a	103 A-E G	67a
61 A-F	46a	90 A-F	59a	104 A-D F	66a,68a
62,63 A-E G	47a	91-93 ABCDEF & Fn 16	58a	105 A D F	66a
64-67 ABCDE G	48a	94 A-F	60a	106 A-D F	69a
68 A-E H	49a	95 A-F	61a	107 A-E G	70a
69 A-E G & Fn 11	49a	96-97 A-E G	a	108-112 ABCDE H Fn 17	71a
70 A-E G	48a			113 A-E G	72a
71-73 ABCD G	48a,50a,51a			114 A-F	73a
74-79 ABCDE G I & Fn 12,13	52a			115 A-F	74a

Contributor: (a) Koppanyi, T.

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